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[1925

LI.—THE WITHER-TIP DISEASE OF LIMES.

S. P. WILTSHIRE.

The three photographs of the wither-tip of limes which accompany this article have recently been received from the Hon. Joseph Jones, lately Curator of the Botanic Gardens, Dominica. They illustrate very clearly the various types of damage caused by this disease, which is due to the fungus *Gloeosporium limetticolum*.

The island of Dominica is at present suffering from an epidemic of this disease, as severe as that of the rust (*Hemileia vastatrix*) which wiped out coffee-growing in Ceylon, about the eighties of the last century, and the history of the outbreak affords yet another example of the devastation which can be wrought by a single virulent fungus parasite. The disease was first recorded in Dominica on 8th May, 1922, and the attack was confined to a small area in the south of the island. By 1st October, few of the principal lime cultivations in the island remained unaffected and to-day only trees growing in exposed, dry situations are free from the malady. The loss to the island through this scourge of its staple crop is clearly revealed in the crop returns—1921, 516,000 barrels of fruit; 1922, 400,000 barrels; 1923, 228,000 barrels—and the serious nature of the calamity has been recognised by the British Government, who, in 1925, made a grant in aid to the Colony to help it tide over the period of disaster.

The first photograph depicts the symptoms of the disease as it occurs on the shoots. The fungus can only infect immature organs and is commonly observed on the tips of the young shoots, which it causes to die back. The young stem is weakened at the point of infection and in a short time the shoot above bends over, turns brown, then blackens and dies. On the leaves,

dark coloured patches which later turn light brown appear, usually at the margins, and as the leaves mature the diseased patches do not extend but on drying fall away, leaving the mutilated laminae to function as leaves. Such deformed leaves resemble, at first sight, those attacked by insects, whilst when the infection occurs in the lamina and not at the leaf margin, a shot-hole effect may be produced. Leaves which are not killed outright, if very seriously infected, may be shed and the stem left bare below the dead tip of the shoot.

The damage to the foliage and young shoots, however, although serious, is not nearly so important as the loss occasioned by the attack on the fruit. The general appearance of affected trees from a short distance is not very different from that of normal ones except as regards the lack of fruit. The infection of the blossoms may take place through the petals before the flower opens, through the stigma or directly on the surface of the ovary. In petal infections, the flower frequently fails to open, whilst the petals, instead of remaining creamy white, become water-soaked at the affected part, turn brown and wither up. The fungus appears to grow through the petals to the stigma, whence it proceeds to travel down the style to the ovary. Diseased blossoms usually fall, but fruit attacked after it has set may reach the size of a walnut before doing so. The percentage of flowers which normally reach fruition is small, and even with an abundance of blossom the disease is so virulent that frequently all the fruit on a tree is destroyed. Figure 2 shows good examples of blossom infection, the healthy central shoot being in marked contrast with the diseased shoots on each side.

Fruits attacked late may survive and reach maturity, though frequently undersized, malformed and disfigured with unsightly scars representing the work of the fungus. Such fruit is useless for export as fresh limes, but can, of course, be used for the extraction of the juice. Fruits when about half grown become resistant to infection and when this stage is reached they may safely be counted on to ripen. Figure 3 represents a number of malformed fruits which have managed to survive infection although badly marked.

Flushes of growth occur at intervals during the year, chiefly in February-March and May-June, but each successive flush becomes infected with disheartening regularity. A moist atmosphere favours the fungus, and it is only on account of the unusually dry seasons with which Dominica has been favoured since the outbreak began, that the crops have been as large as they have. The outlook of lime-growing in Dominica is not altogether hopeful. The planters relied too much on this single crop—a temptation which can be well understood by the extraordinary way in which the lime tree flourished there in former times. It is difficult to foresee what will be the outcome of the present situation, but it may be that alternative

PLATE II.



Fig. 1.

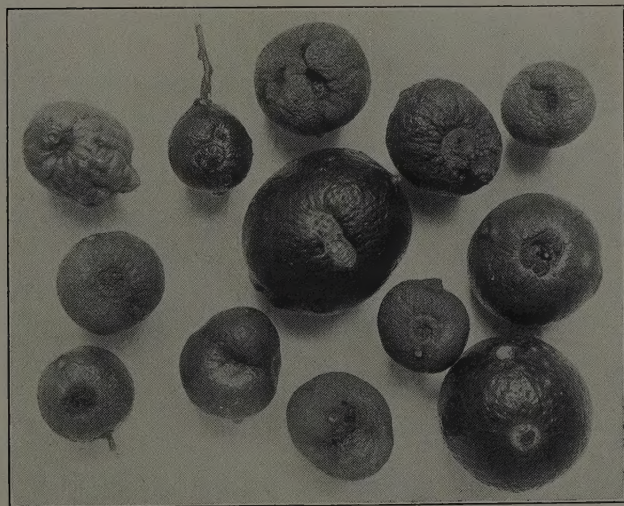


Fig. 3.

Photos by A. S. Burleigh.

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PLATE III.

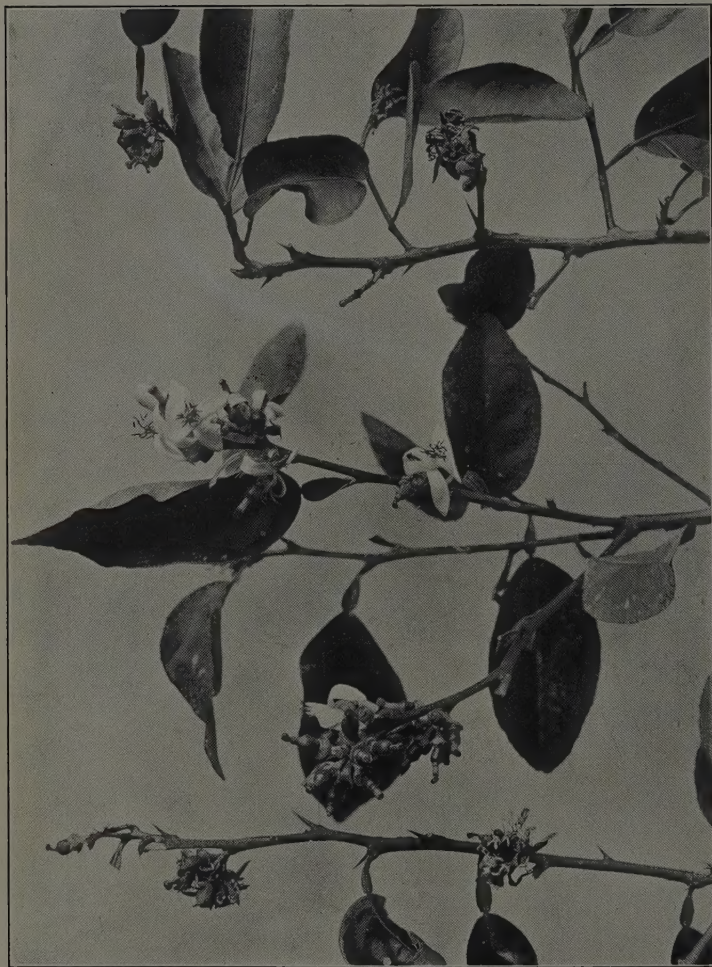


Photo by A. S. Burleigh.

Fig. 2.

crops will be grown more and more, whilst there is always a hope that a resistant variety of lime will be forthcoming which will once more put the industry on a prosperous basis.

LII.—KIKUYU GRASS.*

W. LYNE WATT.

Kikuyu Grass (*Pennisetum clandestinum*) is now well distributed throughout the whole of Kenya, where it is a native. It is most common between the elevations of 3000 and 10,000 ft. From information gathered from the natives, the distribution was not so complete in past years; for instance, it occurred very locally around the west side of Mount Kenya. There was, however, a general movement amongst the natives of that district some two or three generations ago, and as each family migrated, they carried with them a bundle of the Kikuyu Grass rhizomes. This grass makes excellent grazing for stock, and is much appreciated in districts where severe droughts are prevalent. It has now been well established in South Africa, Australia, and New Zealand, where it has been introduced by means of its rhizomes.

There appears to be some prevalent idea here and abroad that Kikuyu Grass is incapable of producing seed; perhaps this is due to the fact that the seeding spikelets are very inconspicuous. Seed can only be found after careful examination of the old turf, which has been subjected to regular grazing by cattle. Grass which has formed a rich rampant growth very rarely produces seed. The first indication of likely seeding will be the 1-inch long silvery stamens blowing in the breeze. Three to twelve months later, the seed may be collected by hand, or the whole cut over very close to the ground, dried and the seed beaten out. The ripe spikelets, two or three in a cluster, are usually to be found in close proximity to the ground. The best method is to extract each grain by hand, and when local natives have been taught how to perform the operation they will usually each find 300 clean grains per day. When the seed is procured by simply beating the dried grass it is extremely difficult to get the grain free from the glumes.

In Kenya it is a common sight to see seedlings on fresh cultivated ground, where cattle, after grazing over Kikuyu Grass, have passed and dropped their dung. This is a great nuisance in young forest plantations, where the native herds often stray from their pastures. The grains, when sown in a sheltered bed, will germinate in a little over two weeks. If the grains are planted at wide intervals in the seed beds, the young plants may be left till they are large enough to be divided, when the roots can be planted out in the open for further multiplication.

* A former article on Kikuyu Grass appeared in *K.B.* 1921, p. 86.

LIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.*

ADDITAMENTUM XVII.

D. G. DOWNIE.

This Additamentum completes the diagnoses of the orchids examined by Mr. Rolfe to which reference was made in the previous Additamentum.

Sarcanthus recurvus *Rolfe mss.* [Orchidaceae-Vandaeae]; *S. arietino* Reichb. f. affinis sed foliis conspicue recurvis, calcare pro rata longiore, petalis latioribus acutioribus differt.

Epiphyte, pendulous, sometimes branched at base, stem 8.5–13.5 cm. long, about 0.5 cm. diameter, densely leafy; vaginae slightly ridged, overlapping, nearly 1 cm. long; internodes about 0.5 cm. long. *Leaves* pectinate, patent, recurved, probably fleshy, terete, often broad at base and tapering gradually to rounded or obtuse apex, 3–5 cm. long, 2–3.5 mm. diameter at middle. *Inflorescence* racemose, pendulous, breaking through vagina, occasionally branched near the base, much longer than leaves, 10–15 cm. long, peduncle about 2.5 cm. long with one or two completely sheathing bracts; flowers many (to 40), deflexed; flower bract narrowly triangular, with rather long tapering point, 2–3.5 mm. long, 1 mm. broad at base, shorter than ovary and pedicel; flower small, 6–7 mm. long. *Sepals*, posterior oblong, apex rounded, slightly concave, patent or reflexed, 2.5 mm. long, 1.25 mm. broad, 1 middle vein and 2 smaller side veins; lateral oblong, reflexed, oblique, subacute, slightly incurled at apex, 2.5–3 mm. long, 1.5 mm. broad, 3-veined. *Petals* oblong-ovate, reflexed, narrower than sepals, 2.5 mm. long, 1 mm. broad; labellum trilobed, 3.5 mm. long (junction with column to middle lobe), 2.5 mm. deep (lateral lobe to apex of spur); lateral lobes erect, triangular, apex truncate-rounded, about 0.5 mm. high, margin thickened between lateral lobe and column; middle lobe fleshy, triangular, obtuse, rounded basal angles, grooved down middle, hollowed out at base, apex with short acuminate erect point, 1.5–2 mm. long (including point), 1 mm. broad at base; spur cylindric, obtuse, rounded, well-marked groove postero-anteriorly round spur, inside back is large lobed callus, near foot are 2 rather long, narrow, deflexed lobes, main body of callus thickened and pubescent at base, grooved down middle, separated into 2 rounded slightly diverging lobes at base, inside in front is longitudinal lamella broadening out near mouth, tapering to very short septum at base and continued as very narrow lamella a little way up back, tip of lamella and mouth of spur at level of base of callus pubescent. *Column* short, stout, sloping, 1–1.5 mm. high, 0.75 mm. broad across stigma, continued into a foot

* Continued from *Kew Bull.* 1925, p. 394.

(about 1.5 mm. long); narrow projection at each side at top of column and within that on each side a rather large fleshy lobe overhanging stigma; clinandrium with fairly high wall at back; stigma rather deep, occupying about half the length of column; anther subrounded, apex truncate; pollinia 2, globose, attached to apex of almost cordate thin stalk which has thickened horse-shoe-shaped ridge at further end, including stalk 0.75 mm. in length. *Ovary* and pedicel 4–5 mm. long.

Doi Sutep, 300–450 m.; pendulous on trees, deciduous jungle, May 24th, *Kerr* 97.

“There are in Herb. Kew a drawing of *S. arietinus* by Day which was identified by Reichenbach, and a flower from Hort. Glasnevin which came under the name *S. arietinus*. Both agree in differing from our plant in the points noted. Our plant though pendulous, has short leaves and a stiff habit.” R. A. R.

Sarcanthus siamensis Rolfe mss. [Orchidaceae-Vandae]; a *S. appendiculato* Hook. f. labelli lobo mediano multo longius acuminato, a *S. teretifolio* Reichb. f. labelli lobo mediano haud obtuso lobis lateralibus maioribus, a speciebus ambabus calcare brevior robustior recedit.

Epiphyte, roots slender or fairly stout, often branching early; stem erect, 13–34 cm. tall, fairly thick, glabrous, covered by leaf bases; vaginae longitudinally ridged, overlapping; internodes 1–2 cm. long. *Lamina* rather short, terete, probably fleshy, 3–9 cm. long, 1.5 mm. thick, apex rounded or obtuse. *Inflorescence* breaking through vagina, erect, much longer than leaves, 19 cm. long, fairly stout (in cultivated specimen suberect, 5.5 cm. long, i.e., about same length as or shorter than leaves), peduncle with completely sheathing bracts at intervals, longer than lax raceme; flowers about eleven, 13–15 mm. long; flower bract triangular, obtuse, 1 mm. long. *Sepals*, posterior patent, oblong-ovate, slightly concave above middle, apex rounded, slightly emarginate, 7.5 mm. long, 3 mm. broad, 3 main veins; lateral recurved, oblong-ovate, oblique, broadening out again at base, obtuse, 8–9 mm. long, 4 mm. broad. *Petals* recurved, oblong-ovate, very oblique, sub-acute, 6–6.5 mm. long, 3 mm. broad; labellum trilobed, 8.5 mm. long (column to middle lobe), 9 mm. deep (lateral lobe to apex of spur); lateral lobes triangular with fleshy, conical, slightly curved apex, slightly in-bent over mouth of spur, 2.5 mm. high; middle lobe broadly triangular, fleshy, with rounded basal angles, edges rather erect, apex terminating in rather long acuminate incurved projection, 3–5 mm. long (not including acuminate point), 5 mm. broad along base, apical point 0.75 mm.; spur almost cylindrical, tip oblique, rounded, slight groove down middle of tip (posterior-anterior), widening above tip (posterior side) then deeply incurving owing to foot, 6.5 mm. long from base of middle lobe, attached to base of column and side of foot; inside at back is large, lobed callus, 2 conical spreading fleshy lobes at back,

main body below with deep groove down middle terminating in 2 slightly diverging rounded points and broadening out at base where fused to back of spur—main body of spur densely pubescent, fleshy lobes at back almost glabrous; inside in front is fleshy projection on slight cushion at base of middle lobe, this in continuation with thickened part at top of septum; top of septum and rest of throat of spur at this point pubescent. *Column* short, stout, fleshy, 5 mm. high, 3 mm. broad (across stigma), much thickened and pubescent at the base, extended into a foot; clinandrium shallow, slight ridge down middle, depressions in front and also little rounded depressions with pointed wall to outside on each side of stigma and very small lobes on inside overhanging stigma; stigma narrow, oval, 2.5 mm. long, 1 mm. across; anther hooded at back, depressed in front, with apex rounded and emarginate, 2 mm. diameter; pollinia 2, globose, grooved; stalk almost semi-orbicular, 2.5 mm. long and broad, with acute fleshy apex flattened at right angles to stalk; to this apex the pollinia are attached, at other end is a semi-circular horny attachment recurved and partly adhering to underside of stalk. *Pedicel* and ovary 7–9 mm. long.

Chiengmai, Mê Têng, 360 m., on small trees in open jungle, November 3rd, *Kerr* 269.

Cleisostoma siamense *Rolfe mss.* [Orchidaceae-Vandae]; a *C. andamanico* Hook. f. perianthii segmentis longioribus, calcare robustiore, labelli lobo mediano longiore recedit.

Epiphyte, roots stiff, glabrous; stem rather densely leafy (8–11 leaves); internodes about 2.5–3 cm. long; vaginae hardly overlapping, rather loose, 2.25 cm. long. *Lamina* linear-oblong, 11 to nearly 17 cm. long, 1.5–2 cm. broad at middle, tapering slightly at base, apex unequally bilobed, each lobe rounded, very short mucro between (depth of lobing 1.5–3.5 mm.), median vein well marked, grooved on upper surface. *Inflorescence* a large, stout, branched panicle, 40–50 cm. long, peduncle 24–28 cm. long with 3 completely encircling bracts at wide intervals, flower-bearing area about 2 cm. long, densely flowered, slightly furfuraceous; flower bract small, broadly triangular, amplexicaul, apex obtuse, about 1 mm. long; flower 6–8 mm. long, slightly puberulous. *Sepals*, posterior ovate, broadly stipitate, obtuse, emarginate or occasionally subacute, 4–4.5 mm. long, 2 mm. broad, puberulous on back; lateral patent, ovate, broadly stipitate, slightly oblique, apex acute or obtuse, 4 mm. long, 2 mm. broad, fleshy, puberulous on back. *Petals* patent, spatulate, apex subrounded, slightly irregular and very slightly oblique, 3–3.5 mm. long, 1.75–2 mm. broad above middle; labellum shortly trilobed, 3.5 mm. long (column to middle lobe), 3.5 mm. deep (apex of spur to lateral lobes); lateral lobes short, truncate, free end within middle lobe rounded, 0.5–0.75 mm. high; middle lobe cordate, fleshy angles very obtuse, rounded, apex rounded or acute, 1.25–1.5 mm. long, 1.5–1.75 mm.

broad near base, spur short, stout, cylindric, fleshy, 2.25 mm. broad at centre, inside at back is oblong, erect, irregularly truncate lamella broadening at base, forming a pocket with back of spur 1.5 mm. high, 1 mm. across; inside front of spur very thick, fleshy, hollowed at base of middle lobe, with 2 fleshy lamellae converging down into throat of spur. *Column* short, stout, 2 mm. high (from side, including anther), 1.25 mm. across stigma; a fleshy flange on each side of stigma; rather prominent bilobed rostellum, lobes broad, truncate, vertical; clinandrium rather flat, slight ridge down middle, highest in centre, from this point to rostellum the face slopes and is grooved down middle; stigma rather deep, about 0.75 mm. long, 0.75 mm. across, with fleshy cushion at base; anther 0.75 mm. high, semi-orbicular, acuminate, 1.25 mm. across, 1.5 mm. down middle to acuminate apex; pollinia 2, globose, grooved, stalk slender, curved, linear, about 1.5 mm. long, 0.25 mm. broad; gland rather large, oval, grooved, about 0.5 mm. long, attached at right angles to base of stalk. *Ovary* and pedicel 3-3.5 mm. long. *Capsule* 19 mm. long, 6 mm. diameter; pedicel 4 mm. long.

Near Lampang, Mè Tan, 360 m., on trees in mixed jungle, flowers green, May 8th, *Kerr* 301.

Ascochilus loratus Rolfe mss. [Orchidaceae-Vandaeae]; ab *A. hirtulo* Ridl. labello trilobato recedit.

Epiphyte, roots long, slender, more or less flattened, ridged down middle, glabrous; stem 1-1.5 cm. long, leaf bases overlapping, longitudinally ridged, about 4.5 mm. long, 3 mm. broad. *Leaves* spreading; lamina 5-13 cm. long, 0.7-0.9 cm. broad, lorate, very slightly tapering to apex and base, apex very unequally bilobed, longer lobe generally rounded, shorter truncate, both irregularly bluntly toothed, difference between length of apical lobes 3-7 mm. *Inflorescence* shorter than leaves, rather slender, 3-4.5 cm. long, glabrous; flower about 1 cm. long. *Sepals*, posterior lorate, slightly obovate, very shortly acuminate, truncate, 4-4.5 mm. long, 1.5 mm. broad at widest part, slightly concave, 1-veined; lateral spatulate, oblique, rounded at apex, 3.75 mm. long, 1.75-2 mm. broad at widest part, 1-veined. *Petals* 4-4.5 mm. long, 1 mm. broad, narrowly lorate, slightly obovate and slightly oblique, 1-veined, apex truncate; labellum trilobed, middle lobe 1.5 mm. long, 1.75 mm. broad, almost orbicular, apex truncate or truncate and shortly bluntly acuminate, hollowed out on each side of a central grooved fleshy cushion; lateral lobes oblong, fleshy, slightly broader at truncate apex, 1.5 mm. long, 1 mm. broad, fleshy ridges at base connected with sides of mouth of spur; claw 2.5 mm. long (between base of lateral lobes and column), sides erect, smooth, 1.25 mm. deep; spur slender, curved, tapering gradually to rounded tip, 5.5-6.5 mm.

long (from top of sides of mouth to tip), 1.5 mm. broad, shortly rather densely pubescent inside especially near mouth. *Column* stout, broadening towards base, 1.5 mm. high, foot practically absent; rostellum a prominent, fleshy, conical lobe 1 mm. long, markedly curved upwards, rather deeply, narrowly grooved all along upper surface to apex; clinandrium shallow, higher at back and front than sides; stigma occupying practically whole length of column. *Ovary* and pedicel about 6 mm. long.

Doi Sutep, 900 m., on small trees near stream in evergreen jungle; lip and spur white, yellow spot on disc, rest of perianth yellow with brown spots; Dec. 10th, *Kerr* 290.

***Sarcanthus carinatus* Rolfe mss.** [Orchidaceae-Vandaeae]; a *S. Parishii* Hook. foliis brevioribus, inflorescentia paniculata elongata, labelli lobo mediano lamella erecta recedit.

Epiphyte, stem erect, thick, 11–25 cm. tall, leafy, internodes 8–12 mm. long. *Leaves* distichous, patent, sessile, slightly conduplicate and keeled, oblong, very slightly unequally bilobed, thickly coriaceous, 4–6 cm. long, 1–1.8 cm. broad, lobes truncate or obtuse. *Scapes* lateral, divergent, paniculate, 10–19 cm. long; common peduncle up to 6 cm. long, with one or two completely sheathing bracts; bracts triangular, acute, 1.5 mm. long; flowers small, numerous; pedicel 5–6 mm. long. *Sepals* patent, posterior ovate-oblong, subobtuse, concave, 4.5 mm. long, 2.5–3 mm. broad; lateral oblong, obtuse, oblique, 4.5–5 mm. long, 2.5–3 mm. broad. *Petals* linear-oblong, subacute, 4–4.5 mm. long, 1–1.5 mm. broad; labellum deeply trilobed, lateral lobes triangular, apex incurved, obtuse, with fleshy pyramidal projection on inner face of apex giving bidentate appearance, 2 mm. long; near mouth of spur is prominent carinate projection; middle lobe triangular-oblong, very fleshy, suberect, 2.5 mm. long, 1.5 mm. broad, side angles very short, fleshy, acute or obtuse, prominent erect lamella running longitudinally down middle of middle lobe, connected with spur, septum highest at junction of spur and middle lobe (1 mm. high); spur oblong, obtuse, 6 mm. long from lateral lobe, longitudinally divided and bilocular, puberulous on inner face near mouth, callus at back large, rounded, tapering towards septum, grooved down centre, puberulous, 1–1.5 mm. high, mouth of spur in front fleshy, puberulous. *Column* oblong, 2 mm. long without anther, narrow flange along margin, extending into foot with broad flanges, up to 1 mm. high; rostellum of two truncate lateral flanges below clinandrium; clinandrium wall ends in two small triangular fleshy projections above and outside rostellum lobes; stigma 1 mm. long, fleshy margin on lower side; anther 1.5 mm. diameter, about 0.5 mm. high, almost orbicular, hooded, with rather broad depressed area down middle ending in extended depressed thin area in front, margin undulate and 3-lobed; pollinia flattened, curved, grooved; caudicle short, flattened horse-shoe shaped at end away from pollinia, canalled and with

two erect wings. *Capsule* elliptic-oblong, 1-1.5 cm. long; pedicel 0.5 cm. long.

Doi Sutep, 450-750 m., on trees in deciduous jungle, May 30th, *Kerr* 182.

***Galeola integra* Rolfe mss.** [Orchidaceae-Neottieae]; species nova a *G. javanica* Benth. partibus maioribus, labello integro recedit.

Terrestrial, erect, 63 cm. tall; stem glabrous for greater part, furfuraceous near tips, stout at base, closely set with concave scales 10 mm. long, 8 mm. broad, which are more scattered above. *Inflorescences* terminal or axillary, forming a very loose panicle up to 10 cm. long; flower bracts triangular, concave, furfuraceous on back, 3.5 mm. long, 4 mm. broad at base; flowers crowded at apex, 14 mm. long without ovary. *Sepals* 10-14 mm. long, 6.5 mm. broad, subequal, ovate to broadly ovate, apex acute and rather thick, furfuraceous on back, 6 to many-veined. *Petals* ovate to broadly ovate, 10 mm. long, 5-6 mm. broad, grooved on back, apex rounded to acute; labellum thick, fleshy, orbicular, 7 mm. long, 8 mm. broad (in bud), deeply concave, sides erect, grooved on back, apex very slightly inrolled and very shortly apiculate, margins entire, inner face pubescent especially on obovate ridged callus. *Column* without anther 7 mm. long (in bud). *Capsule* 6.5 cm. long, 0.6 cm. diameter.

Doi Sutep, 900 m., on humus in evergreen jungle; perianth greenish brown, lip yellow; May 19th, *Kerr* 304.

***Galeola Kerrii* Rolfe mss.** [Orchidaceae-Neottieae]; ab affini *G. Cathcartii* Hook. f. labello basi auriculato recedit.

Climber, stem 4 mm. diameter, furfuraceous, branching; roots 3-4.5 cm. long. *Inflorescence* lateral, paniculate, 16-20 cm. long, spreading, large percentage of flowers developed, subtended by triangular, concave scales 2.3 cm. long, 1 cm. broad, furfuraceous especially at base. *Sepals* strap-like, rounded to acute at apex, 22 mm. long, 4.5 mm. broad, furfuraceous on back. *Petals* narrower than sepals, rounded at apex, 20-25 mm. long, 3-3.5 mm. broad; labellum broadly ovate (when flattened out), concave, rounded at apex, 16 mm. long, 11 mm. broad, margin irregularly toothed, the teeth deeper towards apex and disappearing towards base; side lobes erect, inner face with small scattered calli. *Column* erect, 8 mm. tall without anther; anther 1.5 mm. tall, with conical lobe on back; stigma protected by thin flap. *Ovary* 2-4 cm. long including pedicel.

Doi Sutep, 900 m., climbing on trees in evergreen jungle; flowers yellow; May 14th, *Kerr* 253a.

***Galeola nana* Rolfe mss.** [Orchidaceae-Neottieae]; ab affini *G. pusilla* Hook. f. labello emarginato haud apiculato margine eroso recedit.

Terrestrial, 9 cm. long, slender, sinuous, branched; scales large, especially near base, close together, not completely sheathing, 7 mm. long, rather more than 2 mm. broad. *Inflorescence* terminal, two or more flowered; flower 1-1.5 cm. long, excluding ovary; bract 2.5 mm. long. *Sepals* ovate, very shortly truncate, 15 mm. long, 6 mm. broad (posterior sepal slightly narrower), 5-7-veined, furfuraceous on back, apex incurled. *Petals* almost oblong, rounded at apex, slightly wider at base, 14 mm. long, 4.5 mm. broad, central vein well marked and unbranched, side veins branched, slightly furfuraceous on back; labellum very broadly ovate with a short truncate-rounded, emarginate, erose apex; inner face of apex covered with numerous short papillae; lower part slightly gibbous, grooved on back, smooth but with callused bar down inner face and one acute papilla on each side of bar, veins well marked on side lobes which stand erect partly enclosing column. *Column* 6 mm. tall without anther, 2.5 mm. across, slightly curved at clinandrium; stigma covered by thin flap; rostellum a small, rounded, almost erect flap; clinandrium with rather irregular margin; anther furfuraceous on back.

Doi Sutep, 900 m., on humus in evergreen jungle; flowers pale yellow, lip darker; Aug. 4th, *Kerr* 313.

***Galeola siamensis* Rolfe mss.** [Orchidaceae-Neottieae]; a *G. Kerrii* Rolfe bracteis longioribus angustioribus, labello multo brevioris magis rotundato auriculis magnis instructo differt.

Climber, stem 6 mm. diam. *Inflorescence* paniculate, 3-20 cm. long, terminal or lateral, arising in axil of scale 16 mm. long, 7 mm. broad, loosely arranged except at tips of final branches where bracts are very close together; few flowers developed; flower bract rather long, narrow, densely furfuraceous on back, 4-6 mm. long, 2 mm. broad, concave, thick. *Sepals* furfuraceous on back, 18 mm. long, 3 mm. broad; veins about four, parallel. *Petals* slightly narrower than sepals, 18 mm. long, 2 mm. broad, three parallel veins; labellum 10 mm. long, 9 mm. broad at widest part, short, round and with large erect auricles; auricles irregularly dentate on margin, inner face with scattered papillae; base of labellum closely embraces column. *Column* 8 mm. long, 2 mm. across. *Ovary* 5 mm. diameter.

Doi Sutep, 960 m., climbing in evergreen jungle, July 10th, *Kerr* 253.

***Vanilla siamensis* Rolfe mss.** [Orchidaceae-Neottieae]; species nova distincta, a *V. Griffithii* Reichb. f. floribus multo maioribus, labello et columna valde diversis recedit.

Climber, flowering branches 6-7 mm. diameter, internodes 7-9 cm. long. *Leaves* petiolate; lamina broadly ovate, acuminate, tapering at base, 9-23 cm. long, 4.5-10 cm. broad, many-veined; petiole stout, winged, 2.5 cm. long, 0.5 cm. broad.

Raceme lateral, 8–10 cm. long; bracts occasionally deflexed, more often erect and closely enveloping stem, 8 mm. long, 8 mm. broad, deeply concave; flowers erect, numerous, 4.5 cm. long without ovary. *Sepals* narrowly ovate, rounded and slightly inrolled at apex, 4.5 cm. long, 1.2 cm. broad, veins numerous, parallel. *Petals* similar to sepals but slightly broader and not so thick, 1.5 cm. broad, down middle of under side is a groove with a narrow flange in the centre; labellum when flattened out wedge-shaped with a terminal triangular lobe (in bud, 2.8 cm. long, 2 cm. across widest part, terminal lobe 1 cm. long), the terminal lobe has a large number of lobulate fleshy filamentous papillae on upper face 3–6 mm. long, 1–2.5 mm. broad, in mature flower the terminal lobe recurves and papillae then become conspicuous, side lobes triangular, with rounded apex, 4 cm. long, 3.6 cm. broad across side lobes, erect, closing round column, outer margin undulate and folded; half way down inside lip is a hinged brush-like process made up of 5 scales, 3 are large, folded, fringed, and fanshaped, 4 mm. tall, 6–10 mm. broad, the other 2 are small, fringed processes at the sides on the upper edge, further down centre are a few small scattered papillae, down centre back is a groove but no flange like other petals. *Column* semi-terete, 2–2.8 cm. tall, face pubescent, hairs longer near top, stigmatic canal appears half way down column protected by hairs; stigma semi-circular, with two collateral flaps 2 mm. long and 2 mm. broad on lower side and one large thin flap forming part of stigma and base of clinandrium, 4 mm. long, 4 mm. broad (rostellum); clinandrium wall erect, slightly lobed; anther attached by short broad stalk and with two prominent lateral conical papillae on back. *Ovary* and pedicel about 2 cm. long. *Capsule* 19.5 cm. long, 2.5 cm. diameter.

Doi Sutep, 690 m., climbing up trees to heights of 15 or 20 ft., finally pendulous, stem nearly 2 cm. diameter, dark green; leaves twisted at insertion to stem; flowers opening successively, slightly scented; sepals and petals light green, lip white, interior tinted yellow near base; *Kerr* 95.

Anoectochilus Lylei Rolfe mss. [Orchidaceae-Neottieae]; species nova ob lobos angustos et calcar grande distincta.

Stem about 25 cm. long, in part creeping, leafy area 5 cm. long; axis stout, internodes 1.5 cm. long; axis above leafy area 15 cm. long, very slender, bearing scales at intervals of 4–5 cm., the lower scales sheathing, the upper non-sheathing. *Leaves* spiral, petiolate, vaginate, broadly ovate, apex acute, 4–5 cm. long, 2.8–3.2 cm. broad, two sides slightly unequal, 5-veined; petiole including vagina 1.5 cm. long; vagina broad, membranous, sheathing. *Inflorescence* axis 3 cm. long, with 4–6 flowers; flower bract 10 mm. long, 4.5 mm. broad, broadly ovate with long tapering point, pubescent; flowers medium-sized. *Sepals*, posterior 6 mm. long, 4 mm. broad, broadly ovate, acuminate, with narrow rounded apex, concave, pubescent on

back, 1-nerved, adhering closely to petals to form hood ; lateral not spreading, 10 mm. long, 3 mm. broad, adpressed to petals, lanceolate, curved, broad at base, acuminate with rounded apex, swollen at base on one side of midrib. *Petals* linear on side nearest posterior sepal, obovate, acuminate on other side, 7 mm. long, 2.5 mm. broad, 1-nerved, apex acute ; labellum 22 mm. long from spur to lobes ; lobes diverge 45° , lanceolate, tapering, rounded at base, sometimes acuminate at apex, 9 mm. long, 2 mm. broad ; claw 2 mm. long, grooved above, with two small fringed flanges at the sides, 1.5 mm. long, 1 mm. broad, fringe 0.5 mm. long ; spur 10 mm. long, 2 mm. diameter, two oblong lobed calli inside spur at 7 mm. from tip. *Column* about 2.5 mm. tall, two large triangular projecting wings 2 mm. long, 1.5 mm. broad, down front ; anther ovate, with long tapering point, 3.5 mm. long ; rostellum broadly ovate, with two short pincer-like teeth at apex. *Ovary* 10 mm. long, 2 mm. diameter ; pedicel 1 mm. long.

Mê Awn, 750 m., in evergreen jungle ; flowers white, leaves green with reddish veins ; Jan., *Lyle in herb.* Kerr 297.

A plant collected by Micholitz in Annam at Lang Bian, 1500 m., is evidently also this species.

Anoectochilus multiflorus Rolfe mss. [Orchidaceae-Neottieae] ; floribus numerosis, labelli stipite edentato a speciebus aliis recedit.

Terrestrial, erect, slender, 36–43 cm. tall, upper part pubescent ; leafy area 13 cm. long, internodes 1–3 cm. long. *Leaves* spiral, petiolate, vaginate ; lamina ovate, apex acute or very shortly mucronate, 7–10 cm. long, 3–4 cm. broad, midrib with six veins on each side ; petiole about 4 cm. long including the membranous, sheathing vagina. *Inflorescence* axis 8.5 cm. long, covered with a dense rather short brown pubescence, many-flowered ; flower bracts 6–12 mm. long, 3–5 mm. broad, ovate, tapering to a point, concave, pubescent on back ; flowers medium, about 2 cm. long including ovary. *Sepals*, posterior erect, concave, ovate, acuminate, 7.5 mm. long, 3 mm. broad, 1-nerved, tip rounded, incurved or recurved, joined with petals to form a hood but slightly projecting beyond ; lateral 7 mm. long, 4.5 mm. broad, broadly ovate, tapering gradually to rounded apex, which is slightly recurved and decurved, 1-nerved, slightly saccate at base on side near labellum. *Petals* oblique, linear on side adhering to posterior sepal, on other side orbicular, acuminate, 8 mm. long, apex curved ; labellum lobes two, diverging 180° , each lobe wedge-shaped and erose on two sides, 5–6 mm. long, 2.5–3 mm. broad, expanse of lobes 8 mm. ; claw 1–1.5 mm. long, curved and edges inrolled ; spur short, round, fleshy, 2-lobed, 5–6 mm. long, margin thickened and crenate ; two triangular flaps arise below margin of spur and cover mouth ; a large, oblong, 2-lobed callus occurs inside each lobe of spur. *Column* about 3 mm. tall, with two broad fleshy lobes on each

side at front; anther cordate, with long tapering point; clinandrium hooded; rostellum two narrowly triangular lobes. *Ovary* 10–11 mm. long, 1.5–2 mm. diameter.

Doi Sutep, in very shady jungle close to summit; sepals greenish, petals white; Sept. 22nd, *Kerr* 197.

***Odontochilus repens* Downie** [Orchidaceae-Neottieae]; ab affini *O. yunnanense* Rolfe indumento densiore, labelli stipitis dentibus maioribus recedit.

Terrestrial, stem 20–26 cm. long, procumbent, erect part 9–12 cm. tall, leafy area about 4 cm. long, internodes 1–1.8 cm. long. *Leaves* spiral, petiolate, vaginate, ovate, apex acute or very shortly mucronate; lamina 3–5 cm. long, 1.5–2.5 cm. broad, 3-veined; petiole including the membranous, sheathing vagina 1–1.5 cm. long. *Inflorescence* axis 3.5–4.5 cm. long, densely tomentose, few-flowered (3); bracts 8–10 mm. long, 4 mm. broad, ovate, with long tapering point, 2–3-nerved, tomentose on back; flowers medium-sized. *Sepals*, posterior suberect, ovate, rounded at apex, slightly auricled at base, 6 mm. long, 4 mm. broad, pilose on back, 1-nerved, adhering to petals to form hood; lateral not spreading, curved, rounded at apex, broad at base and saccate on one side, pilose on back. *Petals* somewhat wedge-shaped, curved and narrowly lanceolate on side next posterior sepal, on other side broadly obovate and acuminate, 6 mm. long, 3 mm. broad, 1-nerved, sparsely pilose on back; labellum lobes two, wedge-shaped, diverging 45°, 9 mm. long along middle, 5–5.5 mm. broad at middle, sparsely pilose, margin irregular, claw about 1 cm. long, grooved on upper side, edges incurved; teeth 6–9 mm. long on sides of outer half of claw; spur short, round, fleshy, 2-lobed, 2.5 mm. long, an oblong callus inside each lobe. *Column* 3 mm. long, with rather broad lobed wings on each side in front; anther cordate, apex slightly recurved; clinandrium dilated; rostellum a cordate flap with a bilobed apex forming pincer-like teeth which enclose gland; gland ovate, dark coloured, 0.75 mm. long. *Ovary* 11 mm. long, 2.5 mm. diameter.

Doi Sutep, 720 m., evergreen jungle, on damp rock by stream; perianth green with darker lines, lip white; May 23rd, *Kerr* 307.

Mr. Rolfe has used the same specific name on the sheets in the Kew Herbarium, but under the genus "*Anoetochilus*," although he indicated the affinity to *O. yunnanensis*. The structure of the flower is that of an *Odontochilus*.

***Zeuxine sutepensis* Rolfe mss.** [Orchidaceae-Neottieae]; a *Z. flava* Trim. floribus minoribus, labelli lobis lateralibus fere orbicularibus recedit.

Stem 9.5–17 cm. tall; leafy area 3.5–8 cm. long; internodes 1–2.5 cm. long; axis above leafy area 3–10 cm. long, with scales. *Leaves* spiral, petiolate, vaginate; lamina broadly lanceolate, tapering, apex acute, base rounded, 1.7–3 cm. long, 0.6–1 cm.

broad, rather membranous, with midrib and one or two side veins; petiole about 1.3 cm. long including membranous sheathing vagina. *Inflorescence* axis 1.5–3 cm. long, with rather long scattered pubescence; bract 6 mm. long, 2.5 mm. broad, ovate, long acuminate, tip acute, 3-nerved, scattered pubescence on back, long scattered cilia on edges; flowers 9 mm. long including ovary. *Sepals*, posterior broadly ovate, deeply concave, truncate-rounded and slightly incurled at apex, 4.5 mm. long, 2.5 mm. broad, one distinct nerve, long scattered hairs on back, joined with petals to form hood; lateral 3.5 mm. long, 2 mm. broad, ovate or narrowly ovate, apex rounded or acute, 1–3-veined, long scattered hairs on back. *Petals* linear-spathulate on side adhering to posterior sepal, on other side broadly ovate, acute, undulate, stipitate, 4 mm. long, 1.5 mm. broad, 3-veined, slightly puberulous on back; labellum 4.5–5 mm. long, lobes almost orbicular, about 2 mm. long, 2 mm. broad, 2-veined, expanse of lobes 4.5 mm.; claw short, broad, flat or with sides erect, 1 mm. long, 1 mm. broad, slight groove towards spur; spur saccate, fleshy, 2 mm. long, 1.5 mm. deep, two thick fleshy oblong calli inside, sides of spur enclosing column, only anther tip and rostellum lobes projecting. *Column* 1 mm. high, nearly 2 mm. broad, winged; stigmas two, lateral; rostellum of two erect, prominent, clavate or truncate-clavate lobes, 1 mm. long; anther narrowly ovate, very shortly acuminate, about 1.75 mm. long; pollinia narrowly pear-shaped; attachment linear, horny, apex acute where attached to pollinia, rounded and larger where attached to gland; gland oval, about 0.5 mm. long. *Ovary* including pedicel, 8 mm. long, 1.75 mm. diameter.

Doi Sutep, 660–1200 m., common in evergreen (*Castanopsis*) jungle; lip and petals white, sepals greenish; Jan. 24th, Kerr 212.

Zeuxine vittata Rolfe mss. [Orchidaceae-Neottieae]; a *Z. goodyeroide* Lindl. foliis angustioribus, labelli lobis oblongis haud rotundatis reedit.

Terrestrial, 29–55.5 cm. long, at first creeping and rooting, then erect; leafy area 6.5–10.5 cm. long; internodes 1.5–3 cm. long; axis above leafy area 21–23 cm. long, with scales at intervals of 4–6 cm. *Leaves* spiral, petiolate, vaginate; lamina lanceolate, tapering to pointed apex, round or tapering at base, 5–9 cm. long, 1.1–2.1 cm. broad; petiole 1.3–1.8 cm. long including broad, membranous, sheathing vagina. *Inflorescence* axis 4.5–5 cm. long, rather densely pubescent; bract membranous, pink coloured, ovate, tapering to long narrow point, 5–6.5 mm. long, 2.5 mm. broad, one prominent vein, densely pubescent on back; flowers more or less crowded at tip, 10–12 mm. long including ovary. *Sepals*, posterior broadly ovate, tapering, concave, apex rounded, 4–4.5 mm. long, 2.5–3 mm. broad, 3-veined, puberulous on back, forming hood with petals; lateral narrowly ovate, rounded at apex, incurved, 4–4.5 mm.

long, 1.5–1.75 mm. broad, 3-veined, puberulous on back. *Petals* linear-lanceolate on side of posterior sepal, on other side orbicular, acuminate, 3 mm. long, 1.5 mm. broad; labellum 5 mm. long, lobes oblong, 1.75 mm. long, 1.5 mm. broad; claw about 1.25 mm. long, grooved on upper side, with straight broad flanges; base saccate with broad triangular flanges and two small calli inside. *Column* very short, with wedge-shaped flange 2.5 mm. broad in front; rostellum lobes nearly 2 mm. long, edges incurled; anther attachment 2 mm. long, ovate, broadly stipitate. *Ovary* 6–9 mm. long, 0.75–1 mm. diameter, pubescent.

Between Prê and Nan, Hui Mê Sa Kawn, 420 m., on humus in damp evergreen jungle: calyx green, lip white, leaves with broad pale green band along midrib; Feby. 15th, *Kerr* 294.

***Aphyllorchis caudata* Rolfe mss.** [Orchidaceae-Neottieae]; *sepalis longe caudatis valde distincta.*

Terrestrial, stem erect, stout, 1.3 m. tall, aphyllous; scales lanceolate, the lower 4 cm. long, sheathing, the upper non-sheathing; lower internodes 16 cm. long. *Raceme* terminal, 70 cm. long; bracts narrowly lanceolate, tapering, 4–5 cm. long, 0.5–0.6 cm. broad, 5-veined; flowers at 18 cm. intervals, more crowded at tip, 6–7 cm. long including ovary; pedicel 1.7 cm. long. *Sepals*, posterior lanceolate, tapering to very long narrow apex, concave, 3–3.5 cm. long, 0.8 cm. broad, three main veins, scattered short pubescence on back; lateral similar, slightly narrower and less concave. *Petals* similar to sepals but thinner, smaller and apex not so long, 2.2 cm. long, 0.45 cm. broad, short hairs on midrib only; labellum fleshy, about 1.4 cm. long, outer half of epichile broadly ovate, acute or acuminate, inrolled at apex, inner half with two rather round erect auricles which come together; claw with two erect, long, narrow triangular wing-like parts, apex rounded, 4 mm. long, 2 mm. broad. *Column* 1.4 cm. long without anther, narrow, curved; clinandrium has slightly tuberculate lobed outgrowths on each side less than half height of anther; rostellum a fleshy oval cushion; stigma long, narrow, oval, with a narrow flange at each side, the tips of which enclose the rostellum; anther shortly stalked, 2 mm. long, 1.5 mm. broad (in bud). *Capsule* 4–5 cm. long, 1–1.5 cm. diameter.

Doi Sutep, 1050 m., on humus in evergreen jungle, *Kerr* 316.

Distr. Yunnan, Szemao, 1200 m., *Henry* 12969.

***Aphyllorchis unguiculata* Rolfe mss.** [Orchidaceae-Neottieae]; ab *A. Prainii* Hook. f. bracteis brevioribus magis obtusis, perianthii segmentis brevioribus et pro rata latioribus differt.

Erect, 20–64 cm. tall, rather stout, aphyllous; lower scales sheathing, 1.5 cm. long, upper free, 1.2 cm. long, 0.2 cm. broad; internodes 2–7 cm. long. *Inflorescence* 12–20 cm. long, lax; bracts generally recurved, lanceolate, subacute, 11 mm. long,

2 mm. broad, 3-nerved; flowers 2 cm. long including ovary; pedicel 5-7 mm. long. *Sepals* subequal, posterior slightly broader, broadly ovate, apex rounded and slightly hooded, 12 mm. long, 5.5 mm. broad, 3-veined, scattered pubescence on back. *Petals* oblong, apex truncate-rounded, 11 mm. long, 5 mm. broad, slightly twisted, margin crenulate, 1-veined; labellum 10 mm. long, epichile 7.5 mm. long, 6 mm. broad, cordate, rather fleshy, margins inrolled near apex and distantly crenate, many-veined, base auricled; isthmus 3 mm. long, with two upright triangular flaps 3 mm. high. *Column* 9.5 mm. long; rostellum small, ovate; anther shortly stalked. *Capsule* grooved, pubescent, 2 cm. long including pedicel.

Doi Sutep, 600-900 m., near streams, flowers white; Aug. 26th, *Kerr* 157.

***Leucolena siamensis* Rolfe mss.** [Orchidaceae-Neottieae]; a *L. ornata* Ridl., cui affinis, labello angustiore haud bilobato inter alia recedit.

Terrestrial, tuber long, narrow, 2-4.5 cm. long, 0.2-0.4 cm. diam.; rootlets long, slender; stem slender, 17-24 cm. tall, aphyllous, lower scales vaginate, upper non-vaginate, internodes 2.5-4 cm. long. *Raceme* terminal, 1.5 cm. long; bracts closely set, 1 mm. long, punctate; flowers few, 1-1.5 cm. long, including ovary and pedicel. *Sepals* and *petals* similar, three posterior ovate to obovate, rounded at apex, 5-6 mm. long, 2.5-3 mm. broad, generally 3-veined, joined to a little below middle, two anterior together rather broadly obovate, truncate-rounded apex with slit down middle reaching just below half way, each 6 mm. long, 2 mm. broad, 3-veined, slightly pouched at base; labellum 5 mm. long, 2 mm. broad, narrowly wedge-shaped, broadly acuminate, apex truncate, slightly emarginate and slightly inrolled over large pear-shaped callus at tip, middle part thickened and raised throughout length, ending in two small calli near base of column, sides deflexed, three main veins, middle one running underneath thickened ridge. *Column* 3.5-4 mm. long, not including anther; stylidia about 2 mm. long, 1.25 mm. broad, with slight broad flat projection at top and slight wing development at sides which broadens towards base; clinandrium an oblong flap with projection at back to which anther is attached; anther almost square, stalked; rostellum a thickened cushion, 2-lobed towards clinandrium, very slightly emarginate at free end. *Ovary* 6.5 mm. long, including rather narrower pedicel.

Doi Sutep, 690-900 m., on humus in evergreen jungle, May 8th, *Kerr* 245; May 19th, *Kerr* 305.

***Gastrodia siamensis* Rolfe mss.** [Orchidaceae-Neottieae]; a *G. exili* Hook. f. floribus maioribus magis curvatis, labelli lobis brevioribus haud patulis recedit.

Terrestrial, tuber 2.5 cm. long, 0.8 cm. diameter; stem

simple, 12–38 cm. tall, slender, aphyllous; scales at first close and vaginate then wide apart and not vaginate. *Raceme* terminal; bracts 4.5 mm. long, 2 mm. broad, triangular, concave, apex rounded, with clear oval protuberances on back; flowers loosely arranged, 12 mm. long including ovary; pedicel 4 mm. long. *Sepals* and *petals* form a tube 10 mm. long, 6 mm. broad, posterior lobes three, large, rounded, 2 mm. long, with erose margins, anterior lobes two, separated from each other by a deeper sinus; petals represented by two small, fleshy lobes, 1.5 mm. long, 1 mm. broad, on either side of posterior calyx lobe, margins erose; lobes not spreading; labellum 1 mm. long, suborbicular, broadly shortly acuminate, apex rounded or truncate-rounded, sides erect, margin crenate and loosely folded; inner face slightly ridged, with two truncate-rounded calli above middle on either side of middle vein, at base two reniform calli. *Column* slender, slightly curved, 5 mm. tall, prolonged into short curved foot; stigma long, narrow, extending almost whole length of column; on each side is a slender wing ending in a pointed lobe just outside anther; rostellum a small rounded flap thickened at margin; anther orbicular, apex truncate, 1 mm. long, 0.75 mm. broad; attachment broad. *Ovary* obovoid, 2 mm. long, 1.5 mm. diameter.

Doi Sutep, 900 m., on humus in evergreen jungle, *Kerr* 198, 198a.

***Habenaria amplexicaulis* Rolfe mss.** [Orchidaceae-Ophrydeae]; ab *H. foliosa* A. Rich. lobo petalino erecto multo breviori recedit.

Stem erect, or procumbent and then erect, 19–30 cm. tall, sheathing scales at base, leafy above; leafy area 10–13 cm. long, internodes 1.5–2 cm. long. *Leaves* ovate or obovate, acute or obtuse, margin entire, base sheathing, total length 9.8 cm.; lamina 8 cm. long, 3 cm. broad, veins up to ten. *Inflorescence* terminal, 3.5–9 cm. long, loosely or rather densely flowered; bracts rather broadly ovate, acuminate, up to 2.2 cm. long, 0.9 cm. broad, 3–5-veined; flowers about 2 cm. long including ovary. *Sepals*, posterior orbicular, concave, apex truncate or obtuse, 5–6 mm. long, 6–7 mm. broad, 5-veined; lateral suberect, narrow, very slightly curved on side of posterior sepal, cordate on other side, 7.5 mm. long, 2.5 mm. broad, 3–4-veined. *Petals* bipartite to 2 mm. from base, segments unequal, posterior narrowly strap-like, rounded to rounded-acute at apex, 8–10 mm. long, 0.5–1 mm. broad, 3-veined, anterior narrowly filiform, tapering, rounded at apex, 1-veined; labellum tripartite to 1 mm. from base, lobes narrowly filiform, side lobes 9–12 mm. long, 0.5 mm. broad, central lobe 11 mm. long, 0.75 mm. broad; spur long, narrow, swollen at base, curving where joining lip, a little shorter than ovary, 14–15 mm. long, base ovate, round to rounded-acute at tip. *Anther* cells almost round, with slight mucro at apex, divergent, each cell 2 mm. long, 1.5 mm. broad, tube part rather long; pollinia subrounded; caudicle 2.5 mm.

long, geniculate and bearing irregularly ovate gland at tip; gland about 1 mm. long; staminodes 1.5 mm. long; stigmas two, geniculate, tube-like, 4-angled, attached to narrow triangular concave rostellum which is 2-2.5 mm. high. *Ovary* curved, about 15 mm. long, 5 mm. diameter; pedicel about 3 mm. long, hardly distinguishable from ovary.

Doi Sutep, near foot, close to a dry stream; sepals white, laterals tipped with green, petals greenish; Dec. 4th, *Kerr* 211.

***Habenaria aurantiaca* Rolfe mss.** [Orchidaceae-Ophrydeae]; ab *H. marginata* Coleb. labelli lobis lateralibus brevibus angustis differt.

Terrestrial, 13-19 cm. tall; tubers 1.5 and 1 cm. long; leafy area 2-3 cm. long. *Leaves* lanceolate, apex acute or tapering, for about 1 cm. closely sheathing at base, 6 cm. long, 0.8-1 cm. broad, margin entire, close set, succeeded by scales at wider intervals. *Inflorescence* terminal, rather lax or subdense, 2-5.5 cm. long; bracts narrowly ovate, with long tapering point, 14-15 mm. long, 4 mm. broad, serrulate, 3-veined. *Sepals*. posterior concave, cordate, rounded-truncate at apex, 5.5-6.5 mm. long, 4.5-5 mm. broad, 3-veined, slightly ribbed on back; lateral narrowly ovate, stipitate, sides unequal, rounded at apex, expanded part 7-8.5 mm. long, 3-3.5 mm. broad, stalk part attached to petal, 3 mm. long, 3-veined. *Petals* narrowly triangular, curved towards posterior sepal, rounded to obtuse-rounded at apex, with or without a short triangular mucro, 7-8 mm. long, 4.5-5 mm. broad, forming a hood with posterior sepal; labellum tripartite, middle lobe fleshy, strap-shaped, rounded-truncate at apex, 7-8 mm. long, 2-2.5 mm. broad, margin recurved, 3-veined, side lobes 6-7 mm. long, 1 mm. broad, straight or very slightly curved, apex acute or rounded-acute, entire part of lip 4-5 mm. long, 2-2.5 mm. broad, with a dark furfuraceous curved lobe 2-2.5 mm. long on each side of mouth of spur; spur clavate, slightly contracted and geniculate half way, not so long as ovary, 8-9 mm. long, narrowly longitudinally margined posteriorly and anteriorly, apex truncate. *Anther* cells almost reniform, 2.5-3 mm. long, 2 mm. broad, tubular part very short and curved; stigmas rather long, shallowly canalled, 1.5 mm. long, 0.75 mm. broad; rostellum a short fleshy oval lobe about one-third height of anther; staminode a tuberculate lobe beside anther. *Ovary* slightly curved, 14 mm. long, 3 mm. diameter.

Doi Sutep, paddy fields at foot; flowers yellow, brownish on sepals; Nov. 26th, *Kerr* 125.

***Habenaria Garrettii* Rolfe mss.** [Orchidaceae-Ophrydeae]; ab affini *H. tipulifera* Par. et Reichb. f. bracteis brevioribus, calcare bilobato brevioris robustiore recedit.

Terrestrial, 16-35 cm. tall; leafy area about 2 cm. long; scape erect, lower scales sheathing, internodes 1.5-5 cm. long.

Leaves almost radical, short, lanceolate, acute to acuminate, with sheathing bases ; lamina up to 5.2 cm. long, 1.3 cm. broad, rather prominent midrib on lower surface, sheathing base more than 0.5 cm. long. *Inflorescence* 9–13 cm. tall, lax ; bracts 4.5–6.5 mm. long, 2 mm. broad, rather broadly ovate, acuminate, with long tapering point, 1-veined ; flowers rather small. *Sepals*, posterior 3.5 mm. long, 1.5 mm. broad, ovate or narrowly ovate, concave, apex truncate, 1-veined ; lateral 3.5 mm. long, 1 mm. broad, narrowly ovate, concave, apex rounded, 1-veined. *Petals* like sepals, 4 mm. long, 1.5 mm. broad, 3-veined half way, apex more acute ; labellum tripartite, pubescent, middle lobe 3 mm. long, 0.75–1 mm. broad, shortly tongue-shaped, 3-nerved, with protruberance dark and swollen at sides projecting over mouth of spur, side lobes 2.3 cm. long, filiform, arising at right angles to middle lobe and curled, 3-lobed swollen cushion in front of mouth of spur ; spur 3 mm. long, thick, clavate, short curved neck, swollen pouch 2 mm. long, 1.5 mm. broad, 2-lobed at base. *Anther* cells about 1 mm. long ; staminodes unequally 2-lobed, tuberculate ; stigmas two, bent upwards. *Ovary* 6–8 mm. long, 1 mm. diameter.

Doi Angka, Pa Ngêm, 1100 m., open ground, Sept. 29th, Garrett 61. Doi Sutep, 1500 m., open ground, among grass ; flowers green ; Oct. 30th, Kerr 118 (type).

***Habenaria humistrata* Rolfe mss.** [Orchidaceae-Ophrydeae] ; *H. ensiformi* Hook. f. affinis sed floribus maioribus, sepalis latioribus magis obtusis differt.

Terrestrial, 13–28 cm. tall ; tubers two, ovoid, 10 mm. long, 8 mm. diameter, attached by neck 5–9 mm. long to rootstock. *Leaves* 2 or 3, radical, lying flat along surface of soil, orbicular or ovate, slightly mucronate, 2.2–2.3 cm. long including short petiole of 3 or 4 mm. which sheaths the stem, 1.1–2.2 cm. broad, nearly 2 mm. thick, fleshy, 4 to many-veined ; leafless scape 9–12.5 cm. tall, with scales at 2–3 cm. intervals ; scales 11 mm. long, 3 mm. broad, narrowly ovate, with rather long tapering point. *Inflorescence* terminal, 2–16 cm. long, rather lax-flowered ; bract 7–10 mm. long, 3–3.5 mm. broad, narrowly ovate, with long tapering point. *Sepals*, posterior 6–6.5 mm. long, 4–4.5 mm. broad, concave, cordate, apex truncate-rounded with margins incurved, ridged, minutely tuberculate on back and edges, 3-veined ; lateral 6–7 mm. long, 3 mm. broad, ovate, more or less curved, apex acute or slightly mucronate, margin and back minutely tuberculate, edges slightly incurved. *Petals* 6–7 mm. long, 2 mm. broad, sickle-shaped, inner edge just under margin of posterior sepal, apex tapering, 2-veined, minute projection on each side at base of petal, larger one on side away from posterior sepal ; labellum tripartite, two side lobes much longer and thinner than middle lobe, middle lobe about 8.5 mm. long, pendant, lateral lobes 16–18 mm. long, at right angles to middle lobe ; undivided area about 1.5 mm. long ; horse-shoe

shaped cushion extends round mouth of spur, much thickened at ends which project on lateral lobes; spur slightly curved, 5–7 mm. long, 1.5 mm. diameter, rounded at apex. *Anther* cells reniform, 2.5 mm. high; tubular projection very short; staminodes slightly tuberculate; stigmas two, solid, very slightly canalled, 2 mm. long; rostellum small, rounded. *Ovary* 14–17 mm. long including pedicel, 2.5 mm. diameter.

Doi Sutep, 450–1050 m., open deciduous jungle among grass; flowers greenish brown; Aug. 29th, *Kerr* 194.

***Habenaria recurva* Rolfe mss.** [Orchidaceae-Ophrydeae]; ab *H. lucida* Wall. labelli lobo mediano lateralibus conspicue brevior recedit.

Terrestrial, 75 cm. tall; tuber 5.5 cm. long, 0.9 cm. diameter; basal part of stem covered with loose, funnel-shaped scales; leafy area about 3 cm. long. *Leaves* 6, ovate to slightly obovate, apex acute, tapering to base, 17 cm. long, 4.5 cm. broad, rather prominent midrib, margin entire, sheathing base about 3 cm. long; scape 40 cm. long; internodes 2–4 cm. long; scales lanceolate, generally not sheathing, 1.5–2 cm. long. *Inflorescence* terminal, 17–22 cm. long; flowers many, rather loose to subdense; bracts 7–11 mm. long, 4–5 mm. broad, broadly ovate, with long tapering apex, concave. *Sepals*, posterior hooded, 3.5 mm. long, 3 mm. broad; lateral 4 mm. long, 2 mm. broad, often reflexed, ovate, curved, apex acute, 3-veined. *Petals* form part of hood with posterior sepal, curved, apex truncate, with triangular projecting lobe, a lobe from each petal also covers middle lobe of lip; labellum tripartite, fleshy, middle lobe 4.5 mm. long, 2 mm. broad, curling up to touch hood, ovate, very fleshy at apex, with margins curled back, 3-veined, side lobes 4.5 mm. long, 1.5 mm. broad, reflexed, fleshy, almost spatulate, curved, apex sub-rounded; two projections at base of lip on each side of mouth of spur; spur 19 mm. long, longer than ovary, narrow, curved, elongate, clavate at end, apex acute, recurved. *Anther* cells 1.5 mm. long; staminodes 2-lobed, large lobe triangular, 1 mm. high, tuberculate, projecting forward, small lobe smooth, pointed, projecting towards labellum; stigmas two, claw-like with two projections, larger one curled to meet smaller; rostellum lobe short, triangular, fleshy.

Doi Sutep, 330 m., mixed jungle at foot; flowers green; Aug. 19th, *Kerr* 190.

***Habenaria sutepensis* Rolfe mss.** [Orchidaceae-Ophrydeae]; ab affini *H. corymbosa* Par. et Reichb. f. floribus maioribus inter alia facile distinguenda.

Terrestrial, tubers 2.5 cm. long, 1–1.5 cm. diameter; stem erect, stout, about 63 cm. tall, lower half covered with scales 2.5–4.5 cm. long, sheathing for at least 2 cm., upper scales leafy; leafy area 15 cm. long; internodes 1.5 cm. long. *Leaves* ovate, gradually or abruptly rather long-acuminate, tapering

towards base, 9–17 cm. long, 2·5–5 cm. broad, margin entire, midrib and 5–9 veins on each side; vagina about 1·5 cm. long. *Inflorescence* terminal, about 10 cm. long, densely flowered; bracts ovate-lanceolate, with long tapering point, 17 mm. long, 6 mm. broad, mid-vein with or without side vein, slightly puberulous on back. *Sepals* subequal, posterior rather broader and more concave, ovate, with long tapering point, apex generally recurved, 13 mm. long, 7 mm. broad; lateral 12 mm. long, 5 mm. broad, 3-veined. *Petals* subulate, long narrow pointed apex, broad at base, produced below point of attachment for 2 mm., total length 10 mm., 1·5 mm. broad, two veins fusing half way up to form one; labellum tripartite, middle lobe 10 mm. long, 1 mm. broad, straight, semi-terete, apex acute, curved slightly; side lobes 8 mm. long, 1 mm. broad, incurved, sickle-shaped, apex shorter and rounder; entire part of lip 2 mm. long, 2–3 mm. broad; spur 15–16 mm. long, 2–2·5 mm. diameter, equal in length to ovary, not much curved, tip rounded or acute; a lobe on each side 2 mm. long, 1 mm. broad, at mouth of spur. *Anther* cells distinct, diverging slightly at base, about 5 mm. long including canal part which is half the length; caudicle about 3 mm. long; gland small, rounded; staminodes rounded or truncate at apex, 2·5–3 mm. long, apex papillose, papillae white; stigmas two, narrow, about 2·5 mm. long; rostellum broad, triangular, acute, about 2 mm. high. *Ovary* 16 mm. long including pedicel, 3 mm. diameter.

Doi Sutep, 1560 m., on humus in evergreen jungle; flowers pale green; Aug. 27th, *Kerr* 277.

***Habenaria trichochila* Rolfe mss.** [Orchidaceae-Ophrydeae]; ab *H. trichosantha* Wall. ex Hook. f. labelli stipite brevior, fimbriis magis numerosis linearibus, calcar magis acute angulato differt.

Terrestrial, 53 cm. tall; leafy area about 20 cm. long; internodes 2·5 cm. long. *Leaves* narrowly ovate, apex shortly acuminate, base rather long, tapering, forming a long loose vagina, 20 cm. long including base, 5 cm. broad, margin entire midrib and many side veins; scape with large lanceolate tapering scales 3·5 cm. long. *Inflorescence* terminal, subdensely flowered; bracts 1·5–3 cm. long, 0·4–0·5 cm. broad, lanceolate, tapering to apex. *Sepals*, posterior concave, broadly ovate, slightly mucronate, 7–8·5 mm. long, 4–5 mm. broad, 3-veined; lateral curved, ovate towards posterior sepal, cordate on side away, 9·5 mm. long, 6 mm. broad, 4-veined. *Petals* narrowly strap-shaped, 7 mm. long, 1 mm. broad, curving just under margin of posterior sepal, tapering at apex, 1-veined; labellum tripartite, middle lobe 12–13 mm. long, 1 mm. broad, entire, strap-shaped, tapering gradually to a long point, 3-veined at base, 1-veined at tip; side lobes very much fimbriated, fan-shaped, equal to or slightly longer than middle lobe; entire part of lip 2·5 mm. long, 2 mm. broad; spur very long and very distinctly rather sharply geniculate, from perianth to knee 2 cm. long,

0.5 mm. diameter, 2 mm. diameter at knee, 2.3 cm. long from knee to apex, 1.5 mm. diameter, knee angle a little under 90°, apex generally pointed, almost mucronate; there is a longitudinal posterior-anterior ridge all round spur most marked below knee; mouth of spur has raised ridge all round forming a small projection just in front of lip which covers entrance to spur.

Anther cells reniform, total length 5 mm., 2 mm. broad, tubular part 2.5 mm. long; pollinia with caudicles 3.5 mm. long; staminodes curved, tuberculate, apex pointed, 3.5 mm. long, 0.75 mm. broad; stigmas slender, canalled, nearly 3 mm. long, rostellum a short triangular lobe, 1 mm. high. *Ovary* 2.7 cm. long, 3 mm. broad, curved near petals, closely enveloped by bract.

Doi Sutep, 330 m., mixed jungle; petals and sepals dark green, lip white; Oct. 11th, *Kerr* 264.

***Platanthera Lacei* Rolfe mss.** [Orchidaceae-Ophrydeae]; a *P. susannae* Lindl. floribus dimidio brevioribus, labelli lobis lateralibus altius pectinatis recedit.

Terrestrial, 48 cm. tall; tuber about 2 cm. long; stem erect, leafy all the way, internodes about 6 cm. long. *Leaves* generally closely enveloping stem and with sheathing base 2.5 cm. long, linear-lanceolate, acute or shortly mucronate, 4.5–8 cm. long including base, 1–1.7 cm. broad, midrib and 3–4 side veins. *Inflorescence* terminal, 2-flowered, bracts leafy. *Sepals*, posterior 1.6 cm. long, 1.4 cm. broad, orbicular, margin slightly inrolled near obtuse apex, one median and two or three side veins; lateral broadly ovate, rounded at apex, 1.8 cm. long, 1.2 cm. broad, one median and two side veins. *Petals* 18 mm. long, 3 mm. broad, linear, 3-veined, apex acute; labellum tripartite, middle lobe 18 mm. long, 3.5 mm. broad, 3-veined, entire, linear, apex round, margins near base recurved giving clavate appearance to lobe, small projecting knob near mouth of spur; lateral lobes fringed on outside, 10 mm. long, 3 mm. broad, not including fringe, which is up to 10 mm. long; spur 12–13 mm. long, 1.5 mm. diameter, tapering to acute apex. *Anther* cells ovoid, tuberculate, 5 mm. long, 1.5 mm. broad, tube 1.5 mm. long; pollinia 2.5 mm. long, 1.5 mm. broad, caudicle 3 mm. long; gland 3 mm. long; staminodes reniform, with tuberculate knob on side nearest anther, 3 mm. long, 4.5 mm. broad; stigmas broad, canalled, edges inrolled, 3 mm. long, 2.5 mm. broad; rostellum small, fleshy.

Doi Sutep, 660 m., open marshy ground; flowers pure white; June 12th, *Kerr* 247.

Distr. Burma, N. Shan States, *Lace* 4854.

***Dispersis siamensis* Rolfe mss.** [Orchidaceae-Ophrydeae]; a *D. zeylanica* Trim. cui maxime affinis floribus minoribus, rostellis ramis multo longioribus recedit.

Terrestrial, erect, 4–8 cm. tall; tuber round, 3 mm. diameter; stem swollen at base for 6 mm. and covered by membranous, sheathing scale, 2-leaved, internodes 1–2.5 mm. long. *Leaves*

erecto-patent, broadly ovate, acute; lamina 4.5–6 mm. long, 3.5–5.5 mm. broad at middle, base completely sheathing, 1.5–3 mm. long. *Flower* solitary, erect, pseudo-terminal; bract leafy, 3.5 mm. long, shorter than ovary. *Posterior sepal* fused with *petals* to form a nearly orbicular hood about 5.5–6 mm. long, 5–5.5 mm. broad; lateral sepals 6–6.5 mm. long, 3.5 mm. broad, fused at base, diverging distally, nearly semi-circular, with oblique rounded very shortly apiculate apex and a small pouch-like depression near base; labellum fused in front to column, wedge-shaped, with two long, broad, curved arms stretching at right angles to middle part with furfuraceous patches on outer margin, 1.5 mm. long from base, arms 2.5 mm. long from mid-vein and 0.5 mm. broad at middle; at base two small projecting calli; half way down from apex is a linear projecting lobe with rather thick round apex, 2.5 mm. long, barely 0.5 mm. broad at middle, furfuraceous for 1 mm. *Column* short; rostellum arms curved, 2 mm. long, apex broad, truncate; anther nearly 1.5 mm. long. *Ovary* 9 mm. long, glabrous, sessile.

Doi Sutep, 660–900 m., deciduous jungle; flowers white with violet markings; Aug. 27th, *Kerr* 1987.

LIV.—NEW SPECIES OF STRYCHNOS FROM SIAM.

A. W. HILL.

A parcel of twelve distinct species of *Strychnos* has recently been received from Siam, collected by Dr. A. F. G. Kerr and by Siamese collectors. It contains four new species which are here described, *S. roborans* and *S. Kerrii* belonging to the section *Tubiflorae*, with long-tubed flowers, and *S. viridiflora* and *S. Kawbet* with short-tubed flowers belonging to the section *Penicillatae* and also good flowering material of *S. plumosa* A. W. Hill (*K.B.* 1917, pp. 134, 136 and 171), belonging to the same section. The other specimens unfortunately either have very immature flowers or consist of leaves only and until fuller material is received they cannot be determined.

One, No. 5987, collected by Dr. Kerr at Nakawn Sawan, a woody climber in evergreen scrub, resembles *S. mucronata* A. W. Hill (l.c., p. 181) to some extent but has stouter and smaller leaves and more woody stems with sharp spines and numerous cirrhi. The seeds of No. 802, collected by Phra Winit, are said to be used for clearing muddy water and it appears to be a long-tubed species. Then there is a very distinct large-leaved specimen with marked triplinerved leaves and foxy-red hairs on the nerves whose powdered bark is used in making arrow poisons. This in its leaf characters shows some resemblance to *S. ovalifolia* Wall., but is probably a new species. Finally what promises to be the most interesting specimen of the collection is Kerr's 8336 (*Seng*

ton), a small tree up to 7 metres high having the trunk armed with stout branched spines, the bark of which is used for poisoning dogs. The leaves are large, bright green and somewhat resemble those of *S. Balansae* A. W. Hill (l.c., p. 200), from Tonkin. Dr. Kerr sent a photograph of this tree growing near Ubon which shows formidable branched spines on the trunk. It is neither typical *S. Nux-vomica* nor *S. Nux-blanda*, but until flowers and fruits are received the specimen must be left unnamed.

A set of specimens of Aug. Chevalier's "Plantes de l'Indo-Chine" has recently been presented to Kew, collected by members of the French Forestry Service in Cambodia and Indo-China in 1920. Several of these prove to be *S. Nux-vomica* and bear the native name Cu-Chi. Some of the specimens are said to grow near habitations and in one case the plant is said to be a liane, but they all appear to be *S. Nux-vomica*, and thus strengthen the view that *S. Nux-vomica* is really wild in Indo-China (*K.B.* 1917, pp. 183-188). Though Dr. Kerr is much puzzled by the scattered distribution of *S. Nux-vomica* and has tried to find it in Siam—thinking possibly his No. 8336 might represent that species—his efforts have so far been unsuccessful.

Strychnos viridiflora A. W. Hill sp. nov.; species *S. armata* A. W. Hill affinis, sed frutex non arbor ramis ascendentibus pubescentibus foliis ovatis acutis basi rotundatis praecipue differt.

Frutex scandens, lignosus, ramis ramulisque minute pubescentibus spinis teretibus axillaribus circiter 1·2 cm. longis interdum instructis. *Folia* ovato-vel late ovato-lanceolata, acuta, basi rotundata, 7-8·5 cm. longa, 3-4 cm. lata, trinervia, coriacea, superne vernicosa, venis impressis exceptis glabra, pagina inferiore sparsissime hirsuta nervis et marginibus pubescentibus; petiolis circiter 3 mm. longis pubescentibus. *Inflorescentiae* axillares, corymbosae, compactae, 1·25 cm. longae, pedunculis pubescentibus, pedicellis glabris. *Calycis* segmenta rhomboidea, subacuta, 1 mm. longa, marginibus ciliatis. *Corolla* viridis, 3·25 mm. longa, externe glabra; lobi 1·25 mm. longi, linea pilorum erectorum ad basin instructi. *Antherae* in tubo insertae, cordatae, 0·75 mm. longae, basi barbatae. *Ovarium* ovoideum, cum stylo 1·75 mm. longum, glabrum. *Fructus* ignotus.

SIAM. Mê Wong, Nakansi Sawan, 100 m., in mixed forest, *Kerr* 6005.

This appears to be nearly related to *S. armata* A. W. Hill. It differs in being a climbing plant, also somewhat in the shape of the leaves, and possibly in the size of the flowers. In general appearance the leafy specimens appear quite distinct.

Strychnos roborans A. W. Hill sp. nov.; species *S. Nux-vomica* Linn. affinis, sed corolla minora antheris extrusis filamentis instructis, fructibus seminisque minoribus praecipue differt.

Arbor parva, circa 5 m. alta, vel frutex scandens, rami novelli minute pubescentes, vetustiores glabri cortice vernicoso obtecti.

Folia ovata, subacuta, 5–7.5 cm. longa, 3–5 cm. lata, paullo emarginata glabra, basi rotundata, trinervia, pagina superiore vernicosa, inferiore canescenti. *Inflorescentiae* corymboso-paniculatae ramulos axillares 4-folios terminantes pedunculi et pedicelli pubescentes. *Calycis* segmenta late rhomboidea, acuta, marginibus ciliatis, 1 mm. longa, 1.25–1.5 mm. lata. *Corolla* laete viridis, 1–1.2 cm. longa, lobis 3 mm. longis, tubo intus versus basin hirsuto. *Antherae* 1.75 mm. longae, ovoideae, e tubo exsertae, filamentis 0.75 mm. longis in sinubus insertis. *Ovarium* cum stylo glabrum, 1.2 cm. longum. *Fructus* globosus, aurantiacus, vernicosus, 2–2.5 cm. diametro. *Semina* circiter 2, 1.2–1.5 cm. diametro, subrotundata, compressa, indumento contexto nitido oblecta.

SIAM. Nakawn Sawan, circiter 50 m., *Kerr* 5993 (type). Kamburi, 20 m., *Winit* 529. Dong Pyā Yen, Chaibadān, *Kerr* 7973 A (type). Menam Pasak, Keng Koi, circiter 50 m., *Kerr* 7973. Kao Pong Sawawng, Muak Lek, Saraburi, *Noe* 113.

Siamese name : Phya Mu Lek.

This species is described by the collectors as a small evergreen straggling tree about 15–20 ft. high, or a scandent shrub in open deciduous forest or in evergreen forest or on the edge of the savannah. The bark and the root are said to be used for curing fever.

The name *roborans* has been given to this species as the Siamese name means 'Lord of the Iron hand' or 'Lord with the Iron hand.'

Very similar to this species is a specimen from Cochin China, collected near Bien hoā by an officer of the French Forestry service (March 16th, 1920), bearing fruits only, which from the size of the fruits and seeds and from the leaves is certainly not *S. Nuxvomica*. Professor Lecomte has kindly sent M. Dop's species of *Strychnos* to Kew, and from an examination of the type specimen of *S. usitata* (Dop in Bull. Soc. Bot. France lvii. p. 19—mem. xix), it seems evident that the Bien hoā plant (March 16th, 1920) belongs to this species. The fruit measurement, given by Dop as 22 cm. with one seed 13 mm. in diameter, is obviously a misprint for 2.2 cm. or 22 mm., as the fruits and seeds of the type specimen conform to these amended measurements.

Strychnos Kawbet A. W. Hill sp. nov.; species *S. mucronata* A. W. Hill affinis, foliis ovatis acuminatis venis pubescentibus, inflorescentiis multifloris, corollae lobis linea pilorum medio notatis instructis praecipue differt.

Frutex scandens, lignosus, ramis et cirrhis dense villosis pubescentibus. *Folia* ovato- vel elliptico-lanceolata, acuminata, 3–6.5 cm. longa, 3 cm. lata, basi cuneata, superne paullo vernicosa, glabra, sed venis—pagina inferiore praecipue—petiolisque villosis pubescentibus. *Inflorescentiae* axillares, multiflorae, pedunculis hirsutis. *Calycis* segmenta late ovata, acuta, 0.85–0.9 mm. longa, marginibus ciliatis. *Corolla* viridis, 3.5 mm. longa, lobi

2 mm. longi, intus medio linea pilorum erectorum transverse notati instructi. *Antherae* cordatae, mucronatae, in sinibus insertae, 0.9–1 mm. longae, basi barbatae. *Ovarium* ovoideum cum stylo glabrum, 1.5 mm. longum. *Fructus* ignotus.

SIAM. Pōn Pisai, Nawng Kai, 200 m., in mixed deciduous forest (Feb. 1924), *Kerr* 8551.

Native name : Kaw-bet.

Strychnos Kerrii A. W. Hill sp. nov.; species *S. Spireana* Dop et *S. Wallichiana* Benth. affinis, ab hac foliis glabris ab illa stylo hirsuto praecipue differt.

Frutex scandens, glaber, ramulis plus minusve quadrangulatis. *Folia* elliptica, basi cuneata vel rotundato-cuneata, apice abrupte acuminata, 7.5–9 cm. longa, 4.5–5 cm. lata, tri- vel paullo triplinervia, glabra, petiolis canaliculatis marginibus hirsutis. *Inflorescentiae* ramulos axillares foliosos terminantes; pedunculi et pedicelli minute pubescentes. *Calyx* 0.5–0.75 mm. longus, segmentis ovatis ciliatis. *Corolla* glabra, 1–1.1 cm. longa, lobis 2.5 mm. longis reflexis, intus ad faucem linea pilorum erectorum annulatim instructis. *Antherae* oblongae, glabrae, 1.5 mm. longae, ad faucem insertae. *Ovarium* glabrum, 1.5 mm. longum, stylo 1.1 cm. longo in parte inferiore pilis longis diffusis instructo. *Semina* ignota.

SIAM. Mûang Petchabun, 300 m., in evergreen forest (March), *Kerr* 5710.

LV.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII
CONSERVATORUM.

DECAS CXIII.

1121. **Frankenia connata** *Sprague* [Frankeniaceae]; affinis *F. flabellatae* *Sprague*, a qua filamentis inter se et cum petalis connatis, petalis majoribus vix dentatis, stigmatibus elongatis, necnon foliorum marginibus multo magis revolutis differt.

Fruticulus circiter 1.5 dm. altus. *Caules* inferne ramulos laterales gerentes, superne in dichasia foliata desinentes, ut ramuli brevissime densiuscule pilosi. *Folia* propter margines revolutos circumscriptione anguste oblonga vel lineari-oblonga, 3.5–4.5 mm. longa, circiter 1.2 mm. lata, apice obtusissima, basi rotundata, marginibus fere ad medium paginae inferioris revolutis, utrinque minute densiuscule pilosula, nervo medio subtus prominente; petiolus 0.2–0.3 mm. longus; vagina deltoidea, 0.8 mm. longa, ciliata, cum vagina folii oppositi 0.2 mm. connata (ab interiore mensa). *Dichasia* pluries furcata, foliata. *Bracteolae* ovato-oblongae, 2–2.5 mm. longae, 1 mm. petiolatae. *Calyx* 8 mm. longus, extra valde 5-costatus, costis breviter pilosis, parte intercostali minute pilosula; tubus 6.5 mm. longus; lobi 5, ovato-oblongi, 1.3–1.5 mm. longi, basi 1 mm. lati, subhyalino-marginati. *Petala* 5, flabellato-spathulata,

12-12.5 mm. longa, 5.5-6 mm. lata; limbus ungui subaequilongus, flabellato-obovatus, superne rotundatus vix dentatus. *Filamenta* subulato-lineararia, inter se et cum petalis connata; antherae 1 mm. longae. *Ovarium* anguste ovoideo-fusiforme, 2.5 mm. longum; styli rami 3, cum stigmatibus 2.5 mm. longi; stigmata lineararia, 1.5 mm. longa; ovula 3, ab apicibus funiculorum longorum basaliū superne refractorum pendula.

SOUTH AUSTRALIA, Leigh's creek, *J. M. Black* 2.

1122. **Frankenia flabellata** *Sprague* [Frankeniaceae]; affinis *F. serpyllifoliae* Lindl., a qua calycis lobis brevibus subhyalino-marginatis, petalis flabellato-spathulatis, filamentorumque forma differt.

Fruticulus 1.5 dm. altus, e basi ramosus, radice anguste fusiformi circiter 6 cm. longo. *Caules* inferne ramulos laterales gerentes, superne in dichasia foliata desinentes, ut ramuli brevissime hispiduli. *Folia* elliptico-oblonga, 3.5-4 mm. longa, circiter 2 mm. lata, apice obtusa, basi rotundata, plana, margine tantum reflexa, utrinque supra minute pilosula, nervo medio subtus inferne prominulo; vagina depresso-deltaidea, 0.5-0.75 mm. longa, ciliata, cum vagina folii oppositi circiter 0.2 mm. connata (ab interiore mensa). *Dichasia* pluries furcata, foliata. *Bracteolae* elliptico-oblongae, circiter 2.5 mm. longae, 1.5 mm. latae, 0.5 mm. petiolatae, utrinque praecipue subtus pilosulae. *Calyx* 6 mm. longus, extra valde 5-costatus, costis hispidulis, parte intercostali inferne breviter pilosula superne glabrescente; tubus 4.5-5 mm. longus; lobi 5, ovato-oblongi, 1.2-1.4 mm. longi, basi 1-1.2 mm. lati, subhyalino-marginati. *Petala* 5, breviter flabellato-spathulata, 6.5-7 mm. longa, 3.7-4 mm. lata, superne late rotundata, dentata; lamina ungui aequilonga, in unguem latam angustata; unguis apice circiter 1 mm. latus, in basin valde angustatus. *Stamina* 6, inaequalia; filamenta subulata, 4.5-5 mm. longa, inferne (1-1.2 mm. supra basin) 0.5 mm. lata, abhinc sursum sensim attenuata, deorsum in basin angustata; antherae 1.2 mm. longae. *Ovarium* anguste ovoideo-fusiforme, 2.3 mm. longum; styli pars communis 3 mm. longa; styli rami 3, 1.6 mm. longi; stigmata breviter clavata, 0.2-0.3 mm. longa; ovula 3, ab apicibus funiculorum longorum basaliū superne refractorum pendula,

SOUTH AUSTRALIA. Frome river, near Hergott (Marree), fl. Nov. 12, *J. M. Black* 1.

1123. **Frankenia serpyllifolia** *Lindl.* in Mitchell, Journ. Trop. Austral. 305 (1848) [Frankeniaceae]; descriptio ampliata auctore T.A. Sprague.

Fruticulus 1.5 dm. altus, ramosus, caule juxta basin circiter 1.5 mm. diametro. *Ramuli* praesertim juniores breviter hispiduli, superne dichasia foliata ferentes. *Folia* ovato-oblonga vel oblonga, 3.5-5 mm. longa, 2-2.5 mm. lata, apice obtusa vel subacuta, basi rotundata, plana, margine tantum plus minusve revoluta, utrinque breviter pilosula, superne versus margines

longius pilosa, ob margines leviter revolutos pseudociliata, nervo medio subtus prominulo; folia superiora quam inferiora densius pilosa; petiolus 0.3 mm. longus; vagina subdeltoidea, circiter 0.7 mm. longa, ciliata, extra pilosula, cum vagina folii oppositi circiter 0.3 mm. connata (ab interiore mensa). *Dichasia* pluries furcata, foliata. *Bracteolae* elliptico-oblongae, 2.5–2.75 mm. longae, 1–1.2 mm. latae, 1–1.5 mm. petiolatae, utrinque praecipue subtus hispidulae, ciliatae. *Calyx* 5.5–6.5 mm. longus, extra valde 5-costatus, costis hispidulis, parte intercostali pilosula; tubus 4–4.5 mm. longus; lobi 5, herbacei, subulato-lanceolati vel lanceolati, acuminati, 1.5–2 mm. longi, basi 0.7 mm. lati. *Petala* 5, anguste oblanceolato-spathulata, in unguem angustum sensim angustata, 7–9 mm. longa, 2.2–2.7 mm. lata, apice rotundato-subtruncata, dentata. *Stamina* 6, inaequalia; filamenta linearia, 5.5–6 mm. longa, medio 0.3–0.4 mm. lata, in apicem per 2 mm. angustata, in basin per 1 mm. angustata; antherae late oblongae, 0.8–0.9 mm. longae. *Ovarium* anguste ovoideo-fusiforme, 1.7–2.2 mm. longum, 0.4–0.6 mm. diametro; styli pars communis 3.5–4 mm. longa; styli rami 3, 1.8–2 mm. longi; stigmata oblique clavata, 0.3–0.4 mm. longa; ovula 3 ab apicibus funiculorum longorum basium superne refractorum pendula.

QUEENSLAND. Nive river, fl. Sept. 13, 1846, *Mitchell* 626 (Herb. Cantab.).

SOUTH AUSTRALIA. Cootanoorinna, fl. May 7, 1891, *Helms*.

The above description has been drawn up from *Mitchell's* specimen, which is the type of the species. *Helm's* specimen has the final branches of the *dichasia* rather less crowded than *Mitchell's*, which it matches well in other respects. It has calyx-lobes 2.2 mm. long, petals 8.5–9.5 mm. long, 2.5–3 mm. broad, filaments 7–8 mm. long, anthers 1.2 mm. long, unbranched part of the style 5 mm. long, style-arms 1.6 mm. long.

The original description of *F. serpyllifolia* was as follows: "tomentosa hispida, foliis oblongis planis longe ciliatis, floribus solitariis subcapitatis pentameris, calycibus patentim hispidis." This is naturally quite inadequate to determine the species, which has consequently been misinterpreted.

1124. ***Elaeocarpus quadratus*** C. E. C. *Fischer* [Elaeocarpaceae]; *E. Griffithii* Mast. et *E. Hullettii* King affinis, foliis majoribus, rachi inflorescentiae pedicellisque dense lanatis, endocarpio acute quadrato differt.

Arbor mediocris. *Cortex* lenticellis suberosis prominentibus (fide R. N. Parker). *Ramuli* brunnei, glabrescentes. *Folia* lanceolata vel ovato-lanceolata, 11–20 cm. longa, 4–5.5 cm. lata, chartacea, glabra vel subtus plus minusve pubescentia, apice acute vel obtuse acuminata vel subcaudata, basi rotundata vel plus minusve angustata, sinuato-dentata, dentibus obtusis leviter incurvatis; costa subtus prominens; nervi primarii 8–10 pares, arcuati, margines fere attingentes; reticulationes

minutae sed distinctae ; petioli 2-6 cm. longi, glabri vel puberuli, apice incrassato et saepe rugoso. *Pedunculi* axillares, solitarii. *Racemi* 8-14 cm. longi, multiflori, dense albo-lanati ; bracteae minutae, caducae ; pedicelli 0.7-1.5 cm. longi. *Gemmae* late ovoideae, obtusae. *Flores* plurimi, circiter 1 cm. diametro. *Sepala* ovato-lanceolata, circiter 5 mm. longa, extus dense albo-lanata, intus glabra, valde carinata. *Petala* sepalis pistillis et staminibus aequilonga, ad apicem angustata, 5-6-lobata ; lobi ensiformes, glabri, circiter quintam partem petali longi ; reliqua pars petali crassa, marginibus valde incurvatis, utrinque dense hirsuta, intus secundum lineam mediam valde incrassata, parte incrassata cava fere ad basim decurrente, deinde petalum valde carinatum. *Torus* acute 10-lobatus, villosus. *Stamina* 25-26, minute strigosa, toro inserta ; filamenta tertiam partem antherarum aequantia ; antherae lineares, in sectione obtuse quadratae, altera theca aristata, arista quartam partem antherae aequanta, altera theca mutica. *Ovarium* ovoideum, dense hirsutum, 2-loculare ; ovula pro loculo 10, biseriata. *Stylus* ovario valde longior, subulatus, versus apicem glabrescens. *Drupa* ellipsoidea, utrinque obtusa, circiter 1.6 cm. longa, 0.8 cm. diametro, disco suffulta, carne tenui fibrosa. *Endocarpium* 1-loculare, 2-valvatum, oblongo-ellipsoideum, utrinque plus minusve acutum, rugulosum, in sectione acute quadratum, 1.4 cm. longum, lateribus 0.5 cm. latis.

BURMA : Nwalabo, Tavoy, 600 m., December, *R. N. Parker* 2302, 2322 (type in Herb. Kew) ; "Paingkyu to Talé," Thaton District, Feb., *J. H. Lace* 4602 ; "Tenasserim and Andamans," *Herb. Helfer* 704.

The white indumentum of the racemes is persistent until the fruiting stage. The keel at the base of the petal together with the base of the hollow thickening and its incurved margins form two recesses in the base of each petal into which fit two of the lobes of the disc. The two ends of the stone of the fruit are pyramidal and in section the stone is exactly square with remarkably sharp angles.

1125. ***Plectronia tavoyana*** *Parker* [Rubiaceae-Vanguerieae] ; *P. gracilipedi* Kurz affinis, floribus longioribus, foliis ciliatis differt.

Frutex metralis, supra axillas foliorum spinas tenues vix ad 1 cm. longas gerens. *Ramuli* tenues, pilis hispidis adscendentibus tecti. *Folia* lanceolata, longe acuminata, membranacea, 5-6 cm. longa, 1.8-2.2 cm. lata, utrinque hispida, ciliata, nervis 4-paribus ; petioli 2-4 mm. longi, hispidi ; stipulae triangulares, acutae, ad 3 mm. longae, membranaceae, mox rumpentes. *Flores* axillares, solitarii (an semper ?), albi ; pedunculi fere 0.5 cm. longi, sub fructu 1 cm. vel ultra, paullo supra basim bracteolis geminis connatis suffulti. *Calycis tubus* hemisphaericus, vix 2 mm. longus, glaber ; limbus 5-dentatus ; dentes triangulares, acuti, vix 1 mm. longi. *Corollae tubus* 7 mm. longus, intus prope apicem annulo pilorum deflexorum instructus ceterum glaber ; lobi lineares, acuti, tubum paullo

superantes. *Stamina* ore corollae inserta. *Discus* manifestus, tumidus. *Stylus* tubum corollae paullo superans; stigma submitriforme. *Fructus* globosus, ruber, 8 mm. diametro.

BURMA. Tavoy, in dense evergreen forest, flowering and fruiting in November, *Parker* 2250.

1126. *Lasianthus longipedunculatus* *Parker* [Rubiaceae-Psychotriaceae]; *L. Biermanii* King affinis sed pedunculis multo longioribus.

Frutex sesquimetralis, glaber. *Folia* oblonga, acuminata. 15–20 cm. longa, 4–6 cm. lata, in sicco pallida, supra minute lacunosa, marginibus incrassatis undulatis; petioli 1–2 mm. longi, crassi; stipulae 2–3 mm. longae, obtusae, ciliatae. *Flores* caeruleo-purpurei, ad apicem pedunculorum congesti; bracteis foliaceis lineari-lanceolatis, 8–12 mm. longis. *Calycis* tubus subglobosus, 2 mm. longus, lobi 4, lineares, acuti, 8 mm. longi. *Corollae* tubus 9 mm. longus, cylindricus apicem versus paullo dilatatus, extra glaber, intus pilosus; lobi 2 mm. longi, obtusi, intus pilosi. *Antherae* breviter exsertae. *Ovarium* 4-loculare; stylus in tubo corollae inclusus, apice 4-lobato. *Drupae* ellipsoideae, 1.5 cm. longae, purpureo-caeruleae.

BURMA. Tavoy, common in forests, *Parker* 2208 (type), 2242: *Ba Pe* 812 (in herb. Dehra).

1127. *Caralluma stalagmifera* C. E. C. Fischer [Asclepiadaceae-Stapelieae]; species *C. adscendenti* R. Br. affinis, sed corollae lobis apice mucronatis et appendiculis paucis stalagmiformibus munitis.

Herba carnosae, glabra, caule tetragono 5–8 mm. diametro, ramulis gracilibus subangulatis, angulis tuberculis floriferis decurrentibus. *Folia* desunt. *Flores* pauci, solitarii e tuberculis parvis suboppositis; bractee et bracteolae basi pedicelli insertae, minutae, triangulari-subulatae; bractee et aliquando bracteolae basi glandulis inverse subulatis munitae. *Pedunculus* gracilis, circiter 5 mm. longus. *Calyx* fere ad basim 5-lobus, 1.5–2 mm. longus, carnosus; lobi e basi triangulari acuminati. *Corolla* 5-loba, late campanulata, circiter 1 cm. diametro, carnosae; lobi ovato-lanceolati, extus virescentes, intus nigro-purpurei, mucrone crasso albescenti, prope apicem appendiculis aristatis 2 vel pluribus minutis purpureis stalagmiorum more muniti; tubus brevis in fundo viridis. *Corona* libera, simplex, annularis, fusco-purpurea, 10-loba; lobi alternatim bipartiti et breviter trifidi, bipartiti segmentis erectis lineare-lanceolatis leviter curvatis, trifidi superne supra antheras inflexis, lobulo medio rotundato, lobulis exterioribus angustis. *Columna staminalis* e basi corollae tubi orta; antherae horizontaliter supra discum stigmatiferum inflexae; pollinia ascendunt. *Ovarium* carpellis 2 fere liberis ad apicem disco stigmatifero unitis. *Fructus* ignotus.

SOUTH INDIA. Vandalur, near Madras, *Mayuranathan* (comm. F. H. Gravely, May, 1925).



CARALLUMA STALAGMIFERA.

1. Stem and inflorescence (somewhat enlarged). 2. Flower, side view.
3. Flower from above. 4. Apex of petal, showing mucro and appendages. 5. Flower in section. 6. Part of corona.
Figs. 2-6 much enlarged.

1128. *Stipa Blackii* C. E. Hubbard [Gramineae]; affinis *S. aristiglumi* Muell. et *S. geniculatae* Hughes, sed foliis setoso-pilosis et molliter pubescentibus, valva apice pilis 3 mm. longis instructa.

Perennis, dense caespitosa, ad 45 cm. alta. *Culmi* erecti vel geniculati, teretes, glabri, laeves, striati, 3-nodi, nodis pubescentibus exsertis. *Foliorum* vaginae striatae, arctae, firmae, ore breviter ciliatae, superiores glabrae et laeves, basales ad 4.5 cm. longae, persistentes, pallidae, obscure pubescentes; *ligulae* breves, ad 1 mm. longae, truncatae, ciliatae; *laminae* lineares, ad 15 cm. longae, erectae, rigidae, in acumen pungens longe attenuatae, pilis demum reflexis setoso-pilosis et molliter pubescentes. *Panicula* angusta, laxa, pauciflora, ad 17 cm. longa; axis primarius subtriqueter, leviter scaberulus; rami fasciculati, ad 5 cm. longi, erecti vel leviter patentes, scaberuli; pedicelli ad 8 mm. longi, scaberuli. *Spiculae* leviter turgidae,

purpurascentes. *Glumae* acuminatae, membranaceae, apice hyalinae, integrae vel apice plus minusve trifidae, valvam amplectantes, inaequales; gluma inferior 3-nervia, 1.2–1.3 cm. longa; gluma superior 5-nervia, 0.8–0.9 mm. longa. *Valva* cylindrica, leviter turgida, convoluta, 4–4.5 mm. longa et 1–1.25 mm. lata, integra, pilis albis breviter et dense hirsuta, pilis apice productis 3 mm. longis; callus acutus, 1.5 mm. longus, dense hirsutus; arista 2.5–3 cm. longa 2-geniculata; columna 0.8 mm. longa, scaberula. *Valvula* valvam aequans, obtusa vel subacuta.

SOUTH AUSTRALIA. Jamestown, *J. M. Black* 2.

1129. *Stipa fusca* C. E. Hubbard [Gramineae]; affinis *S. eremophilae* Reader, sed glumis longioribus, valvis multo minoribus et dense hirsutis, callo longiore differt.

Perennis, caespitosa, ad 55 cm. alta, *Culmi* erecti, teretes, glabri, laeves, 2-nodi, nodis non exsertis molliter pubescentibus. *Foliorum vaginae* leviter striatae, firmae, laeves, glabrae, ore breviter ciliatae; *ligulae* brevissimae, truncatae, minute ciliatae; *laminae* lineares vel lineari-filiformes, convolutae, in acumen longe attenuatae, sub-flexuosae, ad 30 cm. longae, striatae, glabrae vel tenuiter pilosae. *Panicula* angusta, laxa, ad 20 cm. longa; axis primarius teres, laevis; rami tenues erecti, scabri, ad 6 cm. longi, internodia excedentes; pedicelli scabri, ad 1 cm. longi. *Spiculae* hiantes, leviter turgidae, purpurascentes. *Glumae* inaequales, longe acuminatae, glabrae, integrae, membranaceae, apice hyalinae; gluma inferior 3-nervia, 1.6–2 cm. longa; gluma superior 5-nervia, 1.1–1.4 cm. longa. *Valva* anguste oblonga, 4 mm. longa, cylindrica, convoluta, integra, pallide fusca, pilis fulvis nitidis dense hirsuta; callus acuminatus, 3–4 mm. longus, eodem modo ac valva hirsutus; arista tenuis, 5–6.5 cm. longa, 2-geniculata; columna 1.3 cm. longa; arista et columna scaberulae, albidae. *Valvula* valvam aequans, obtusa, dorso pilosa. *Antherae* 3 mm. longae.

SOUTH AUSTRALIA. Eyre Peninsula, Iron Knob, *Cleland* 3 (type); Mutooroo, *A. Morris* 19.

1130. *Hedychium sino-aureum* Stapf [Scitamineae]; *H. aureo* C. B. Clarke et Mann apud Bak. et *H. densiflora* Wall. proximum, ab illo foliis distinctius et tenuius petiolatis, floribus paululo maioribus, corollae tubo e calyce brevius (1–3 mm., nec 3–6 mm.) exserto, ab hoc foliis magis lanceolatis minoribus in dorso glaberrimis, floribus multo minoribus (tubo 14–16 mm., nec 17–20 mm. longo; labello 7–9 mm., nec 16 mm. longo), distinctum.

Caules e rhizomate ad 6 dm. alti, erecti, subgraciles, uti tota planta glaberrimi. *Folia* circiter 10–12; vaginae arctissimae, superne obscure obtuse carinatae; ligulae purpureae, emarginatae, obtusae, 2 mm. longae; laminae latiuscule (2–3 mm.) vel obsolete petiolatae, lanceolatae, longissime acute acuminatae, undulatae, ad 14–30 cm. longae, ad 2.5–5.5 cm. latae, laete virides, indorso vix glaucescentes. *Spica* densa, 7–11 cm. longa,

foliis summis superata; bracteae oblongae, obtuse vel submarginatae, 10–14 cm. longae, pallide virides. *Calyx* ore obliquo, brevissime obtuse 3-lobus, 8–13 mm. longus. *Corollae* tubus per 3 mm. e calyce exsertus et ibi leviter curvatus; segmenta linearia, involuta, 8–11 mm. longa, pallide lutea. *Staminodia* oblique lanceolata, 8 mm. longa, eodem colore. *Labium* 8–9 mm. longum, 5 mm. latum, ellipticum, ultra medium 2-lobum, pallide luteum, lobis obtusiusculis. *Staminis* filamentum 8–9 mm. longum, aurantiacum; anthera concolor, 5–6 mm. longa.

CHINA. Yunnan, in thickets by streams near Tali-fu, 1750 m., *Forrest* 6914 (type); amongst rocks in open situations on the western flank of the Shweli-Salwin divide, 25° 20' S., 1800 m., Aug., *Forrest* 6974; open situations amongst rocks south of Tengueh, 24° 30' S., 2100 m., July, *Forrest* 18424.

LVI.—MISCELLANEOUS NOTES.

Mr. T. WILTSHIRE, Student Gardener, Royal Botanic Gardens, Kew, has been appointed by the Government of the Sudan, Assistant Superintendent of Government Gardens, Khartoum; Mr. J. SPARROW (*K.B.* 1919, p. 446) and Mr. T. R. HAYES, Student Gardener, Royal Botanic Gardens, Kew, have been appointed by the Secretary of State for the Colonies, Agricultural Assistants, Gambia.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. J. E. BAKER to be an Agricultural Officer, Zanzibar; Mr. E. B. WILSON, M.C., B.Sc., and Mr. R. B. SHORTER to be Superintendents of Agriculture, Nigeria; Mr. W. SMALL, M.B.E., M.A., B.Sc., Ph.D., Mycologist, Uganda, to be Mycologist, Ceylon (*K.B.* 1913, p. 90; 1920, p. 367).

Mr. C. C. CALDER, B.Sc., B.Sc. (Agric.), F.L.S., Curator of the Herbarium of the Royal Botanic Garden, Calcutta, has been appointed Director, Botanical Survey of India and Superintendent, Royal Botanic Garden, Calcutta, and of Cinchona Cultivation in Bengal (*K.B.* 1912, p. 109).

JAMES SYKES GAMBLE.—The death of Mr. J. S. Gamble, C.I.E., F.R.S., which was recorded in the last number of the *Bulletin*, removes one of the last of that band of foresters who, in the early days of the Indian Forest Service, initiated and developed the botanical exploration of the immense unknown forest areas of India.

Mr. Gamble was born in London on July 2nd, 1847. He graduated B.A. at Oxford in 1869 and then, as he was intended for the Indian Forest Service, studied at the French National Forest School at Nancy from 1869 to 1871. Here his interest in systematic botany was early displayed. He devoted his early

morning walks in the country to collecting all kinds of plants in addition to the herbarium of woody plants that had to be submitted as part of the curriculum. This hobby he also pursued in his vacations, collecting in Switzerland, South Germany and North Italy. All these collections, which he left at home when he went to India, were subsequently incorporated in his general herbarium.

He proceeded to India in 1871 and his first post in the Indian Forest Service was in Burma, but within a year he was transferred to Bengal and here he started his regular collecting in the Darjeeling forests. In the first instance he naturally confined himself to the trees and shrubs, which were later enumerated in his Darjeeling List, published by the Bengal Government. From 1872 to 1877 his work lay in the Darjeeling and Jalpaiguri Districts except for a short visit to Allahabad and another to the Simla Hills, during which he made good use of the opportunity to add a great many new specimens to his herbarium.

His system of work was typical of his nature, methodical and careful, leaving nothing to a chance recollection at a later date when the opportunity for verification on the spot had passed, for he records that all specimens as they were collected were numbered and named as nearly as possible, dated and localised, day by day, at the end of the day's work. In 1877 he was transferred to Headquarters, which enabled him to add further to his collections from the Simla flora. In 1879 he returned to Bengal as Conservator, which even in those days was unusually early promotion, and found opportunity to travel in the Sunderbans, Dacca, Chittagong, Chota Nagpore, Santal Parganas and Orissa. The considerable additions to his herbarium which he was able to make from these districts enabled him to publish lists of the forest flora of most of them. He always gratefully acknowledged the assistance he received from his colleagues and others interested in botany, amongst them being Sulpiz Kurz, Curator of the Calcutta Herbarium, Dr. (Sir George) King, Superintendent of the Royal Botanic Garden, Calcutta, Major (Sir Henry) Collett, Mr. Henry Blanford, the meteorologist, Mr. B. W. Baden-Powell, Mr. Robert Ellis, and Mr. C. B. Clarke.

In 1882, after having acted as Conservator for three years, he was confirmed in that grade and was selected for service in the Madras Presidency, where the need for trained and experienced forest officers was becoming pressing. His work took him through the Northern Circle, where he lost no opportunity to increase his collections and where he came in contact with Mr. W. A. Talbot, Forest Officer in the Bombay Presidency, and Mr. Lacc, who had been working in Burma and Baluchistan. His official work here fully occupied his time, and the idea that the time of a forest officer should be confined to work that came strictly within the scope of forestry routine may be gathered from his comment that the arranging and naming of his specimens were carried out only at times when he could consider himself "off duty."

In Madras Mr. Gamble was responsible for much of the foundation of the future policy and work of the Forest Department and

particularly for the extension of the valuable *Eucalyptus globulus* plantations in the Nilgiri Hills. He also urged the experimental introduction of Eucalypts yielding timber of a better class, and of other exotic timber species. In the undeveloped and understaffed condition of the Forest Service in Madras at that period most of the time of the Forest Officers had to be devoted to the selection, settlement and demarcation of forest reserves and to the gradual enforcement of the new forest law, so that it was not possible for him to make very great advances in the scientific management of the forest. Mr. Gamble's advice, however, always sound and practical, laid the foundation in many cases for work that continues to the present day.

In 1890 he was transferred to the North-West Provinces and was given the more important and responsible post of Director of the Forest School at Dehra Dun, a post which he held until his retirement from the Indian Service in 1899. His herbarium, which by then had reached a considerable size, he managed to move with him, and to it he added good collections from the Dun and from the Hills of Jaunsar and Tehri-Garhwal right up to the glaciers of the Upper Tonse Valley. At this period Mr. J. F. Duthie, then in charge of the Saharanpur Gardens, and Mr. C. G. Rogers assisted him in making additions to his collections.

Throughout the period of his service in India he pursued his botanical researches with indefatigable zeal, and ample testimony to the value of his labours in that field is preserved not only in the large herbarium of his own collecting and in his better known works, but in the annotated lists of plants which he observed in the course of his official visits to particular areas, such as the Darjeeling District in Bengal, the Gumsoor tract of the Ganjam District in Madras, the Northern Circars and the Ceded Districts, publications which have facilitated the labours of his successors.

Apart from the collections he made and received in India, which the late Sir George King described in his address to Section K of the British Association in 1899 as "probably the largest collection of plants ever owned in India," he also collected specimens at the Cape of Good Hope in 1890, and after his retirement he made extensive collections in the course of his travels in Switzerland, Italy, Sardinia, Malta, Gibraltar and South Norway. These collections were supplemented by material from his own and other gardens, as well as by many specimens submitted to him by his friends for determination.

For his more particular botanical studies Mr. Gamble selected families such as the *Lauraceae* and *Bambusaceae* which needed careful examination of the flowers, and it was his custom to arrange his dissections for future reference on gummed pieces of paper in capsules or on the herbarium sheets. It was probably also this liking for dissection which attracted him to mosses and hepaticae, at which he had intended to work on retiring from India, but his hope in this direction was not realised owing to the call of other work. His Indian specimens of these families were

named by Dr. V. F. Brotherus and the late Mr. H. Boswell. While on leave in England in 1896 and 1897 he collected British mosses, which he had hoped to deal with himself when he retired, but his other botanical interests, chiefly his work on the Madras Flora, did not permit this to be carried out. He organised the forestry section of the Indian Court at the Paris International Exhibition in 1900, and for this service received the Jury Medal and Diploma.

As an author Mr. Gamble's name will always be first associated with his publication on Indian Trees. We cannot do better in this connection than quote Sir Dietrich Brandis' remarks on this work which occur in the Preface.

"After despatching these collections I considered how to utilize the result of our labours for the benefit of Indian foresters, and I proposed to the Government of India that Mr. Gamble should be entrusted with publication on Government account of a Manual of Indian Timbers. The result has been the excellent handbook, which appeared in 1881, describing the structure and properties of the timber of 906 species, with notes regarding the distribution of the trees, their rate of growth and other matters. Since then Mr. Gamble has been indefatigable in collecting specimens of timbers not included in his Manual, examining them on the system established in 1877-8 and revising the descriptions previously made. The second edition of Indian Timbers, published by him on his own account in 1902, contains descriptions of 1,450 species illustrated by excellent photographs, which greatly enhance the value of the work. This second edition is an entirely new book; it is based upon the intimate knowledge of the species constituting the Indian forests, which the author had acquired during his long service on the forests of Burma, Bengal, Madras and North-West India. He has greatly enlarged the notes on the geographical distribution and on the economic uses of the different species and has added notes on their mode of growth, their sylvicultural requirements and their treatment in the forest. The suggestion made on p. xix of his Introduction, that keys of the distinguishing characters of timbers, as far as they can be seen with the aid of a good pocket lens, be prepared for the trees found on limited areas, should be borne in mind by the authors of local Forest Floras."

This system of descriptive keys for local floras which could be referred for full descriptions of species to the great "Colonial Floras," Mr. Gamble subsequently carried out to great effect in his Flora of the Madras Presidency, and other authors of Indian local floras have adopted the same system.

He was one of the founders of the "Indian Forester" and for some years acted as Hon. Editor, and frequently contributed articles on various subjects connected with forestry or botany.

To systematic botany his chief contributions were his collaboration with Sir George King in working out the "Materials for a Flora of the Malayan Peninsula," his first contribution being the account of the *Caprifoliaceae*, which was published in 1903, and

was followed by that of other orders of *Gamopetalae*. The date of publication of the last part of volume iv almost coincided with the death of Sir George King on the 12th of February, 1909, and after that the sole responsibility for the continuation of the work fell upon Gamble. In 1915 he had completed as far as *Salicaceae*, the Monocotyledons having been published independently in 1907 by Mr. H. N. Ridley. In 1915 he was also asked to undertake the "Flora of the Presidency of Madras." He published the first part at the end of 1915 and subsequently brought out five other parts; the seventh, containing the *Euphorbiaceae*, being in the press at the time of his death. The preparation of this Flora proved an arduous task, but the author characteristically determined to carry it out as thoroughly as possible. This necessitated borrowing specimens from the Royal Botanic Garden, Calcutta, the Agricultural College, Coimbatore, the Forest Herbarium, Travancore and the Royal Botanic Garden, Edinburgh; while specimens of early historical interest in the Du Bois and Sherardian herbaria were borrowed from the Botanic Garden, Oxford. All these specimens Mr. Gamble wrote up with the names they bore in his "Flora" before they were returned to their respective herbaria. In addition to this he incorporated in the Kew Herbarium the Madras herbarium, which had been presented to Kew in 1915 by Sir A. G. and Lady Bourne. In order to carry out this work more conveniently and thoroughly Mr. Gamble worked at the Herbarium at Kew for a part of every month, his last visit terminating only on the 24th of September last.

Mr. Gamble's activities in his retirement were not confined entirely to systematic botany, for from the formation of the Forestry School at Oxford in 1906 until the School had been established on a permanent basis he delivered an annual course of lectures on Indian forestry to the students. His interest in practical forestry, too, he pursued at his home at Liss in Hampshire, where he organised and planted many experimental plots of exotic trees the seeds of which he had introduced. These plots he carefully tended, and he kept exact and detailed records of the work up to the end of his life.

Mr. Gamble fully realised how important it was for a forester to have a sound knowledge of the general principles of botany. In a letter to Kew even as late as last May he writes "One thing may perhaps be said with advantage, and that is that as a Forester in India, I was strongly impressed with the necessity of a knowledge of forest plants for the proper study of forest silviculture and made my collections always with the feeling that the idea which was held by some that a Forest Officer need not be a Botanist (I may add Zoologist or Geologist!) was a great mistake."

The future of his own herbarium, which contained some 50,000 specimens, had been exercising his mind for some little time, and in May of the present year he munificently offered it to Kew as a gift to the nation, being anxious that this splendid collection which had been his life's work should not be lost to the

nation. This generous gift was gratefully accepted, and the bulk of the specimens had already been moved to Kew from his home at Liss when the sad and unexpected news of his death was received.

LIST OF THE BOTANICAL PUBLICATIONS OF THE LATE MR.
J. S. GAMBLE, C.I.E., F.R.S.*

List of trees, shrubs, and large climbers found in the Darjeeling District, Bengal. 8vo. iv+88+xviii pp. Calcutta, 1878.—Ed. 2, revised. iv+89+xvi pp. Calcutta, 1896.

A manual of Indian timbers, &c. 8vo. xix+xxx+522 pp., with a map. Calcutta, 1881.—New and revised edition. xxiii+856 pp., with 20 pl. (including 16 of wood sections). London, 1902.—Reprint of second edition, with some additions and corrections. xxvi+868 pp., with 20 pl. London, 1922.

Preliminary list of the trees of the Ceded Districts. (Ann. Admin. Rep. Forest Dep. Madras, 1884–85, pp. 303–316. 1885.)

Revised list of the trees and shrubs of the Northern Circars, recorded on tour in 1883–84 and 1884–85. (Ann. Admin. Rep. Forest Dep. Madras, 1884–85, pp. 317–331. 1885.)

Description of a new genus [*Microcalamus*] of Bamboos. (Journ. Asiat. Soc. Bengal, vol. lix, pt. 2, pp. 207–208, with pl. 7. 1890.)

The *Bambuseae* of British India. (Ann. R. Bot. Gard. Calcutta, vol. vii) xvii+133+7 pp., with 119 pl. 1896.

The identification of wood. (Journ. Soc. Arts. vol. l, pp. 63–64. 1901.)

Description of a new Himalayan genus [*Gleadovia*] of *Orobanchaceae*. With D. Prain. (Journ. Asiat. Soc. Bengal, vol. lxix, pt. 2, pp. 488–499. 1901.)

A preliminary list of the plants of the Andaman Islands. 8vo. 51 pp. Port Blair, Andaman Islands, 1903.

Materials for a Flora of the Malayan Peninsula. Nos. 14–25 (*Gamopetalae* and *Incompletae*, except *Euphorbiaceae*). With Sir G. King, Sir D. Prain, and others. (Journ. Asiat. Soc. Bengal, vol. lxxii, pt. 2, pp. 111–229; vol. lxxiii, pt. 2, pp. 47–135; vol. lxxiv, pt. 2, extra number, pp. 1–916; vol. lxxv, pp. 1–468. 1903–1915.) [Nos. 14–21, containing the *Gamopetalae*, form a volume with a separate pagination (pp. 1–1126), which is provided with a title-page dated 1909.]

The flowering of the Bamboo. (Nature, vol. lxx, pp. 423–424. 1904.)

Gutta Percha trees of the Malay Peninsula. (Kew Bull. 1907. pp. 109–121.)

New *Lauraceae* from the Malayan region. (Kew Bull. 1910, pp. 142–153, 218–228, 312–321, 357–368.)

The Bamboos of the Philippine Islands. (Philippine Journ. Sci. C., vol. v, pp. 267–281, 1910.)—Some additional Bamboos of the Philippine Islands. (I.e. C, vol. viii, pp. 203–206. 1913.)

Neolitsea Merrill. (Kew Bull. 1911, p. 172.)

A new species of *Schizostachyum* [*S. Fenixii*]. (Philippine Journ. Sci. C. vol. vi, p. 289. 1911.)

The Arundinarias of the hills of Sikkim. (Kew Bull. 1912, pp. 135–140.)

* This list does not include any of Mr. Gamble's contributions to the "Indian Forester," which he edited between the years 1891 and 1899.

Ein neuer *Loranthus* (*L. Meeboldii*) aus Burma. (Fedde, Repert. Spec. Nov. vol. xii, p. 34, 1913.)

New *Fagaceae* from the Malay Peninsula. (Kew Bull. 1914, pp. 177-181.)

Lauraceae [of China]. With notes by E. H. Wilson. (Sargent, Plantae Wilsonianae, vol. ii, pp. 66-86. 1914.)

Flora of the Presidency of Madras. Parts 1-6 (*Ranunculaceae* to *Plantaginaceae*). 8vo. 1160 pp. London, 1915-24.

The Himalayan species of *Skimmia*. (Kew Bull. 1917, pp. 301-303.)

Notes on the Flora of Madras. (Kew Bull. 1918, pp. 223-228; 1920, pp. 49-57; 1921, pp. 312-316; 1924, pp. 235-239.)

The Indian species of *Mimosa*. (Kew Bull. 1920, pp. 1-6, with 7 figs.)

Flowering of *Phyllostachys aurea*. (Kew Bull. 1920, pp. 217-218, with 7 figs.)

Flowering of *Arundinaria falcata* in the Temperate House. (Kew Bull. 1921, pp. 302-306, with 2 figs.)

Neohouzeana, a new genus of Bamboos. (Kew Bull. 1923, pp. 89-93, with 11 figs.)

New *Lauraceae* from Southern India. (Kew Bull. 1925, pp. 126-132.)

Decades Kewenses plantarum novarum, &c. [Descriptions of *Viscum mysorense* and 8 *Euphorbiaceae* from Southern India.] (Kew Bull. 1925, pp. 329-332.)

The Oil Palm*.—The author of this work has entered a line of enquiry that up to the present has been largely neglected in British West Africa. The experiments on which the report is based were conducted mainly with the common or hard-shelled variety (*Elaeis guineensis* var. *communis* forma *dura*). The fruit of this variety is almost invariably described as having a thin pericarp; but it has been found to exhibit considerable variation in its wild surroundings and it also shows decided improvement under good cultivation. Some fruits of the same variety in the Museum at Kew, which were grown in Sumatra, have a pericarp much thicker than the shell, but, on the other hand, some fruits from Ceylon, grown from seed sent as "Abepa" from the Gold Coast, have a pericarp thinner than the shell; the complete fruits might be easily separated, but the nuts, being of normal size in each case, are inseparable.

In a foreword to the Bulletin Sir Hugh Clifford expresses the opinion that central factories and extraction by machinery are essential for an extension of the Palm Oil industry, and the author strongly supports this view. Two factories, he reports, "have been established and are now in operation in parts of the oil-palm belt of Nigeria, which, although not equipped entirely with modern machinery, are carrying on valuable pioneer work that will in the near future prove of great value to the industry." In this connection it may be of interest to note that at the British Empire

* Chemical Investigation into the Products of the Oil Palm (*Elaeis guineensis*), by A. C. Barnes, Special Bulletin of the Dept. of Agric., Ibadan, Nigeria, April, 1924, pp. 1-75.

Exhibition in 1924 Messrs. Manlove Alliott and Co. (Nottingham) had a plant demonstrating the extraction of oil from the pericarp, and this year the firm of Cully Expressors, Ltd. (London), erected machinery at Wembley for the same purpose. The plant shown is capable of dealing with a ton of fruits per hour, or 10 tons a day on an average of a 10 hours day. The fruits for the demonstration were brought over in cold storage, subjected to steam and pressure, and the oil was finally passed through a special purifying apparatus forming part of the series. In the field Mr. Barnes recommends that the fruits be accepted for treatment by machinery only when perfectly ripe. He finds "that bunches of ripe fruit may be stored under cool, dry, well-ventilated conditions for periods of from 7 to 9 days, without seriously affecting the value, or the free fatty acidity of the pulp oil." This is important when it is remembered that the fruit may have to be transported long distances from the forest to the factory, and that the conditions of harvesting will be approximately the same as of old. The main difference as now advocated is that the native collector should be encouraged to bring in fruit for sale instead of oil and kernels. This is in accordance with the recommendations of the Committee recently appointed by the Secretary of State for the Colonies to consider the best means of securing improved and increased production of palm oil and palm kernels in West Africa. The Committee in their Report recognise that "the interests of the native owners of the soil and palms are paramount and must be preserved, but it is in their interests that up-to-date machinery and methods should be introduced in time to cope with the threatened competition from Sumatra and elsewhere, a competition which they can of themselves neither foresee nor guard against."

The "Hard" or fermentation process, the "Soft Oil" process and a "Modified Extraction" process are described. It is recommended that the kernels should be shipped as usual, but that the oil, in order to prevent deterioration in transit, since it is used largely for edible purposes, should be extracted in England, where a ready market may be found also for the cake. Appendices i to v, including Tables of Useful Constants, Sale, Classification and Notes on the Equipment of a Factory for the Extraction of Palm Oil, and a Bibliography, conclude the work.

We regret to have to record the death of Mr. W. R. DYKES, M.A., L.ès-L., which occurred on December 1st. Mr. Dykes, who had been Secretary of the Royal Horticultural Society since 1920, was an acknowledged authority on Irises and Tulips, and his monograph, "The Genus *Iris*," is a standard work on the subject. He was a patient and careful investigator, and the horticultural and botanical world has suffered a great loss through his tragic death in the prime of life.

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